MODEL AIRPLANE NEWS

APRIL 1955 — 35 CENTS

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Nye Masterplans World War 1 Bomber
HANDLEY PAGE 0-400

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your old engine, regardless of condition, is **worth $1.00**

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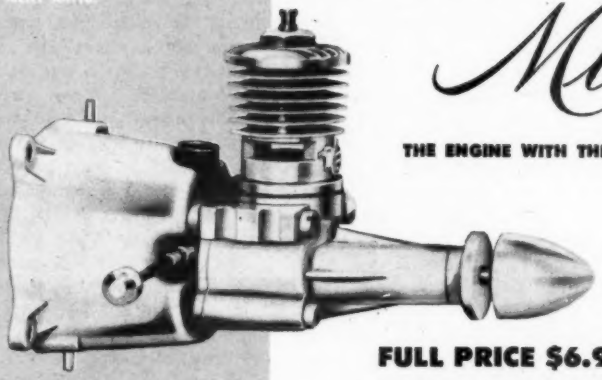
THE NEW DELUXE

Ohlsson & Rice .049

Midjet

THE ENGINE WITH THE NEW V. E.* POWER EQUATION!



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As designers of the Class B Ohlsson & Rice 23 and its companion engines, we are proud to announce a new *basic engine design* for ½A—a design that startlingly increases .049 efficiency while actually decreasing the height over that of any other engine in its class.

The *Midjet* is a midget in size only. In smooth, fully released power it is the TOP performer of its class. And here's more good news, Your old engine—of any make or size—regardless of age or condition—is worth $1.00 toward the purchase of a new deluxe O & R Midjet. I urge you to see it at your model shop. And I warn you—you're going to like it.

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MODEL AIRPLANE NEWS

26th Year of Publication

APRIL 1955 Vol. LII—No. 4

CONTENTS

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Printed in U.S.A.

by William Winter

▶ To the question, asked in MAN at Work, in December, 1954, "Is the hobby dealer indifferent to the model builder?" Henry N. Arms, a Connecticut dealer, answers a friendly but firm, *"No!"* For the benefit of those who were out chasing free flights when all this began, the case was made that we serious modelers do some gosh awful searching for much needed items and that, therefore, the dealer either doesn't know the difference, or he doesn't care. Arms is, first, a free flighter, and secondly, a hobby shop owner. He has one of the largest and best set up toy (and hobby) stores in the Nutmeg state.

"Hobbies now are in all kinds of stores," he begins, "drug stores, candy stores, cigar stores, dime stores. For a dealer to compete with chains and a flooded market, he can't take customers for granted.

"I cannot afford to buy merchandise that is requested only a few times a year. I try to sell what my customers want—to do otherwise is to go broke. Bobbins and prop folders are not the big movers; plastic kits are. I don't like this, even though it makes me money, for the people who buy these kits are the future modelers. (*Arms is not criticizing plastics but infers that the connecting links to becoming a serious hobbyist are missing.*—Editor) The dealer is caught in the middle. He must sell what his customers demand; he can only supply what the manufacturer makes. Extreme prefabrication is the thing.

"We don't have to think back very far to remember the grand old scale kits put out by the Cleveland Model Supply Co.," Arms goes on, warming to the fray, "but today I couldn't get a scale built-up Gee Bee for a customer if my life depended on it.

"You say that today a modeler cannot get an odd size piece of wood, or something. I agree. He won't find it in my place. I cater to the majority of the modelers and (*Continued on page 6*)

PLANE ON THE COVER

Only five years before the atom bomber became an actuality, the German Junkers Ju-87, or Stuka, was the scourge of Europe. Teamed with tanks, it showed the possibilities of the dive bomber on land, helped batter Poland, the Low Countries into submission. The feeling of dread comes through in this painting by MAN cover artist, Jo Kotula. The Stuka was powered by a Junkers Jumo of 1,300 hp. One odd feature, besides Corsair type cranked wings, which it preceded, was the sling for getting the big bomb away from the fuselage in the drop. Old hat now.

NEXT MONTH'S COVER

One of the great racing planes of history, the Wedell Williams held the land plane record, won the Bendix Trophy Race, the Thompson; racked up too many other marks to mention. In 1932, Jimmy Wedell built three of these machines; until 1934, they swept all before them. Wedell, ironically, was killed that year in a training accident. The student froze the stick, was said.

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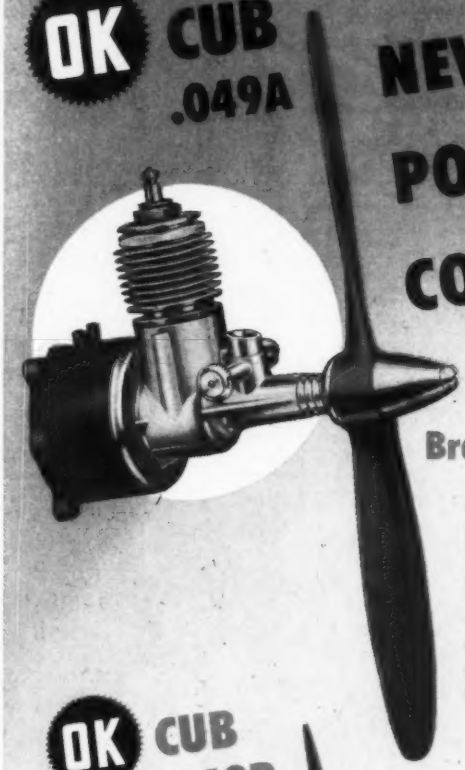

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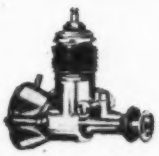
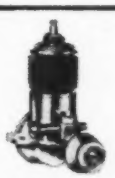
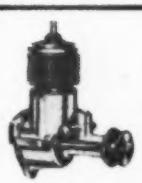


"OK" CUB .049X
$5.75

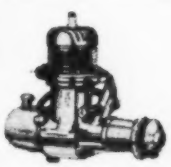
"OK" CUB .074
$5.95



"OK" CUB .099
$6.95



"OK" CUB .14 $7.95
"OK" CUB .19 8.95



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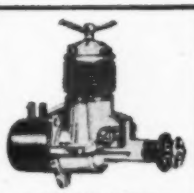
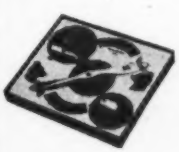


"OK" CUB DIESELS
.049 $5.95
.075 7.50



"OK" COMBINATION PACKAGES

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Save almost $10.00 on this discontinued engine. They're Brand New & Fully Guaranteed. Your choice of ignition or glo.

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FREE 6 matching O&R 45¢ props Free of extra cost with engine.

Spitcraft Speedboat

SAVE!

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$1 DECAL BARGAIN

Just look what you get: 1¾" AMA decals, 62 black decals (2 complete sets of numbers plus alphabet and extra letters), 1 set of 4 star & bar 2", 6 picture decals 2" x 4", 3 sheets of solid colors, 1 sheet checkerboard decals, 6 strips of solid color, plus Tips and Hints on use of decals. A REAL BARGAIN . . . WORTH MANY $$$$.

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Testor's. Reg. 35¢ to 50¢ each. 8" in 10, 12p; 9" in 10, 12p; 10" in 8, 10p; 11" in 6, 10p.

SAVE

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PLUS Every accessory you need, including: all metal parts—flywheel and propeller, drive shaft, etc. PLUS 15 bonus "EXTRAS" at no extra cost!

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MAN at Work

(*Continued from page* 2)

not the minority—that bugaboo known as the serious modeler.

"The members of the local club send away for merchandise. I cannot cut rates. I have to make my mark-up or go out of business. If the boys can send away and get things cheaper, that's all right with me. I would do the same. But when somebody needs Jap pre-war tissue, he comes to me. When I don't have it, the cry goes up, 'Don't go to Hank's; he never has anything.' So I stock what the 95 per cent of the modelers want, and it's prefabrication. Somebody else can have the five per cent. It will be that way as long as prefabrication is all the manufacturer makes and all the dealers carry. But I don't like it and I feel that it has hurt the business."

• • •

▸ When we asked John "Red" Hillegas, famed Cleveland hobby shop owner, if he agreed with Hank Arms, Hillegas, who is one of the best informed people on modeling in America, said, "Well, yes and no.

"Cleveland claims there isn't enough demand for good scale models," Hillegas states, "but they have put out a questionnaire to dealers and will make a series of fighters and bombers if they receive enough orders.

"As for the little items that Henry does not stock because he doesn't get calls for them, we carry them all—bobbins, ball bearing washers, indoor and outdoor rubber, glider stock, tissue, microfilm, washers, prop hooks, thrust bearings and all the sizes of balsa we had before the war, plus 4 and 6 in. widths in sheets.

"Sure, we carry all the plastic models," Red goes on, "the prefabs, the solid Half-A kits that probably never fly, and all the popular engines, including Half-A. If we didn't stock them, our customers would go somewhere else. Certainly, the Half-A engine is better than the typical junk that was sold in bygone days.

"The only objection to Half-A," and here Red lines up his sights, "is that most of the kits for them are too heavy or poorly designed for the rank amateur. So it's the kit that is to blame and, if the customer says he can't cover with tissue, a little explanation can sometimes convince him that it is not too difficult.

"If the engine and kit manufacturers would include instructions for the *beginner*, much trouble would be overcome. The engine manufacturers should include *complete* instructions including recommendations for the size propeller required. They should give an approximate fuel consumption chart or recommend the size tank in ounces for a given length of time. The kit manufacturer should specify the actual size engine to be used and not say, 'from .02 to .099. For that matter, he shouldn't say for engines ABCD. He should make all kits buildable and flyable. He should show a number of the more popular engines installed and note changes necessary to install certain engines.

"He should specify on the plans everything that is in the kit; he should incorporate in the plans the complete control system and not say, 'Install your favorite control system here.' He should assume that every kit will be bought by a person who knows absolutely nothing about the hobby."

• • •

▸ Pan American sponsored PAA-Load models won't be much handicapped by the new rules, judging by the airline's newly announced service to retrieve lost model planes from the air. PAA is supplying a plane and a pilot—the plane the little, one-place Mooney low wing, the pilot none other than Dallas Sherman. Despite his career job with PAA, Dallas has never forgotten his modeling days. He's the guy who dreamed up the idea of making models fulfil some of the requirements of real planes—that is, to carry a load from place to

(*Continued on page* 47)

Flash News

Many developments push back the air frontier -- this monthly report will keep you in the know.

▼

By JOHN F. RUDY

U.S.A. Speeding Guided Missile Development: Official releases reported by columnist Stewart Alsop in the New York Herald Tribune give the United States good odds on nosing out USSR in the race to develop the first practical intercontinental ballistic missile utilizing hydrogen explosive. Both increase of funds and realistic revision of performance requirements, cutting through former snarls of red tape, have sparked negotiations for a 5,000 mile missile firing range, extending into the Atlantic from Florida to the Ascension Islands. Leading off the line of pilotless, jet-propelled, star-guided aircraft is the Snark, which approaches the speed of sound. The ramjet Navajo, a true guided missile, flies at more than twice the speed of sound and is followed by the Atlas, widely considered the truly decisive weapon for the future, which soars 600 miles into space before swooping on its victim.

Tomorrow's aviation talk, today: Willys Motors' (Kaiser) flat, transparent television picture tube the size and shape of a big city telephone book, eventually slated for Navy use as an instrument panel. Two such tubes would be used. One would show altitude, speed, attitude. The other would present something like a radar map. First plane with this system will be flown by Navy in 1958.

Why aircraft are being changed at AF Primary Flying Schools: T-34's will replace most of the PA-18's. Design and flight characteristics of new trainers are similar to aircraft types (T-33 jet) students eventually fly. "Training aircraft are being tailored to the program in lieu of a program tailored to trainers previously available." The Cessna XT-37 should help speed students into flying jets more quickly. This answer, however, depends on evaluation tests now underway at the Pilot Instructors School, Craig AFB, Selma, Ala.

The B-47, 21,000-mile non-stop record: The 47-hour shuttle trip recently between North Africa and Great Britain points up the growth of mid-air refueling. Training and operational flights by AF now require an atomic carrier to refuel on the average of every 3½ hours. But 32-hour B-36 non-stop flights from California to Guam are "routine."

Aeronautical numismatics: Stamp collectors should watch for the new ICAO (International Civil Aviation Organization) stamp. It'll be the first United Nations commemorative stamp of 1955, portraying a symbolic picture of flight on both 3¢ and 8¢ issues.

Flight safety never stops: The 1954 record of safety by commercial planes (a new low of .08 fatalities per 100 million passenger miles) had hardly been achieved before National Advisory Committee for Aeronautics formed a new group to study hazards in plane operations. NACA feels the time to put on pressure for more safety is before accident rates go up, not after.

The remarkable Lt. Col. John P. Stapp! He's going after even higher speeds on his rocket-propelled sled. His 632 mph was the equivalent of a pilot ejected from a 1,000 mph plane at 35,000 ft. Wind pressure forces were about 7.7 psi, or nearly two tons. Stapp hopes to encounter a psi up to 24. But he'll have to leave the 3,500 ft. track at Holloman Air Development Center for longer runs at either Edwards AFB or Inyokern Naval Air Station.

Another folding wing light plane: By Ray Stits of Riverside, Calif., designed as a three-place executive type. Top speed of 165 mph. A 400-mile range, priced about $5,000. Wings fold back by releasing a pin, hook to fuselage. It is supposed to tow up to 50 mph.

Global pro and con: Bigger air forces versus smaller navies. Field Marshal Montgomery is exponent of former; Britain's sea lords will challenge him, perhaps with an assist from U. S. Navy brass. Naval leaders say the real danger is not a hot war and its necessity for giant planes to carry atomic and hydrogen bombs, but continued cold war with small actions that must have naval support, long supply lines, etc.

Is a small plane pilot like an absent minded professor? In some cases, yes, says CAA. In fact absent mindedness caused many of the 3,000 small-plane accidents last year. Two examples are funny, but only because pilots lived to tell about them. Said one who had taxied his plane into another, "I was looking at a giant spiderweb about 60 ft. long attached to the other plane." Another crawled out of the wreckage of a crash, turned to breathless would-be rescuers,

(Cont'd on p. 40)

Monogram

Presents Two Magnificent New

ALL PLASTIC

Cadillac

MODELS

Big 11-1/4 Inch Scale Models with All of the Cadillac Glamorous Details and Appointments! Complete With Driver, Passengers, Rubber Tires and Cement.

Here they are—Monogram's magnificent new Cadillac models. They are 100% faithful scale models of the most wanted—most glamorous cars—ever built. And they're big too—not little 5 or 6 inch models—but full 11¼ inches long. We know you will get more enjoyment—more thrills—out of these Cadillac kits than you ever got out of a plastic kit before. That's a promise. See them at your favorite store quick.

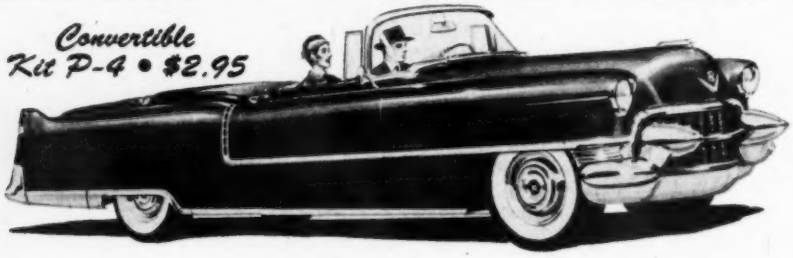
Authorized by General Motors

Monogram developed these beautiful models with the cooperation and authorization of General Motors Corporation. All parts are molded to shape in fine acetate plastic and they snap-fit and press-fit together in a jiffy. Driver, passenger, family dog, rubber tires, steel axles and a big tube of Mono-Glue cement included in each kit.

Exciting Detail Inside and Out

Completely detailed interiors and exteriors. Full dashboard with instrument panel, speedometer, clock, radio, glove compartment, etc. Floorboard and mat, Cadillac insignia and ornament, steering wheel, horn ring, license plates, windshield and wipers. Completely detailed underframe. At dealers everywhere in beautiful full color pictorial boxes.

Convertible
Kit P-4 • $2.95



Coupe de Ville
Kit P-5 • $2.95

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Enter Monogram's Cadillac Letter Contest

Tell in 25 words or less, why you like the new Monogram Cadillac models. That's all you have to do to enter and be eligible to win one of 10 fabulous prizes. Everyone, young and old, has an equal opportunity. Write your letter on the official entry blank, packed with each Cadillac model kit or a reasonably fair copy of it. Letters will be judged on the basis of originality and sincerity by impartial judges who are members of the model industry and their decisions will be final. In cases of tie, duplicate prizes will be awarded.

Contest Closes Midnight, June 15, 1955

See the magnificent Monogram Cadillacs and get additional information from your model and hobby dealer.

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Launched by author, a Half Fast gets off to a fast start, Shirley Austin doing the flying. Shirley scored two kills to take a Nats first.

HALF FAST

By W. F. NETZEBAND, JR.

Miss Shirley Austin ran the Senior Class boys into the ground in combat at the Nationals. In ten flights, design outscored opposition by 11 to 1.

All there is, there ain't no more—and why should there be? Half Fast is sixth in a line of designs. Clocked speed with streamer is 76.8 mph.

Shirley and author fire up a Half Fast. Paint is for pictures—weight a penalty. Too fast, or too slow, a ship not so good—hence the Half Fast.

▶ Fellows, here's the ship used by *Miss* Shirley Austin to win Senior Combat at the '54 Nationals. This is your opportunity to have a ship as good as hers. The other four of us couldn't get any kills, but we got plenty of cuts. With this plane it is fairly easy to give out more than you take. It's fast, quick on the turns, rugged and simple to build. Two evenings are plenty for one and in three evenings, you can build two. If you haven't a large supply of scraps, get to the hobby shop and pick up the stuff listed in the Bill of Materials.

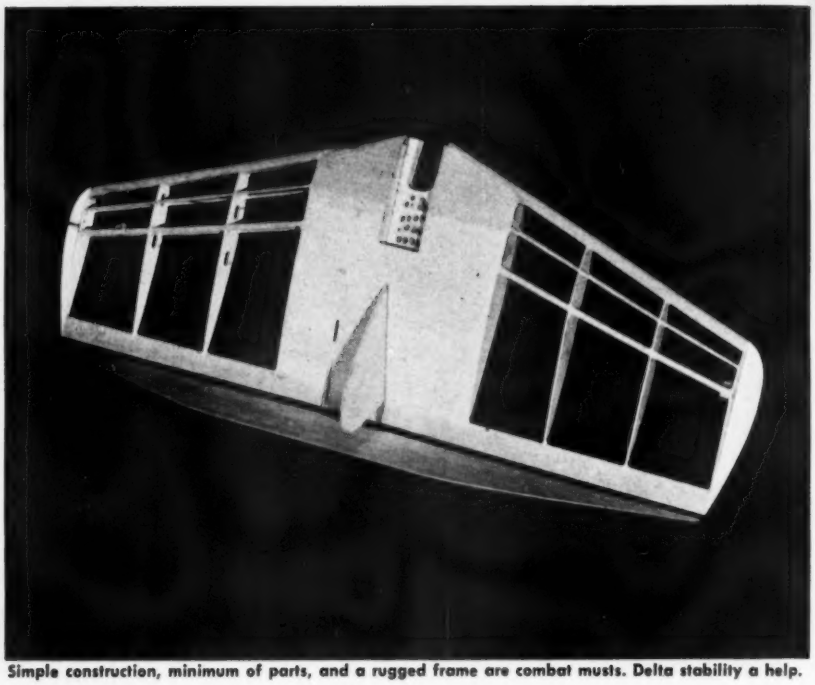
In ten combat flights in all classes we scored 1,100 points, two kills by Shirley and 15 cuts, while we were scored on for 100 points. In most cases, Half Fast was the aggressor, using its superior speed and maneuverability to turn tightly and solidly to carry the fight to the other plane. In local competition, Half Fast has given a very good account of itself; ten different people have built the ship and all of them swear by it.

Historically, Half Fast is the sixth in a line of pure combat ships. One of these was the Scared Kitten, which Frank Zaic used in his 1951-52 Year Book. When the '53-'54 rules came out, it was obvious that combat would develop into "sudden

death," so an extremely simple ship became the goal. One flying wing, defying several aerodynamic laws, was tried and abandoned. Another achieved some degree of success, but it became apparent that we were on the wrong track. So we sat down and did some tall thinking. Having worked with deltas for speed, we tried that tack, which gave the basic shape. The result was Half Fast. No. 1 flew right "off the board" and, after thorough testing, revisions were made. Then I built a jig for assembly and the Austins and Stanfords built eight airplanes. These, including my two, were the ones flown at the Nationals.

Design features are extremely simple construction with an absolute minimum of parts, shortened outboard panel for good solid tug in all positions, rugged frame with engine and tank solidly attached to the lines for maximum safety, delta stability combined with short moment arm maneuverability, low drag and all parts made from stock sizes of wood. Clocked top speed, with streamer, is 76.8 mph. Wing area is 304 sq. in. and elevator, 60 sq. in. Airfoil, NACA 0012; weight, 16 to 22 oz. Center of gravity should be 30 per cent of root chord or forward. Engines used so far include Fox 35 and K & B .32. Since Half Fast was designed around a Fox .35, it is necessary to insert 3/4 oz. of lead in the rear end to balance the ship when using a K & B. This compensates for the 1-1/2 oz. difference in engine weight. Prop tests have proved that a 9 x 8 Power Prop works best for 16 through 19 oz. planes, while a 9 x 7 Tornado works best on 20 through 22 oz. ships. We have burned ordinary stock sport fuels so far with good results.

When I begin construction, I cut out all parts first. The crutch is made from 1/2 x 2 x 6 in. maple or similar wood. Cut-out is for Fox .35 but may be altered for your engine. Be sure the back corners are radiused as shown. Lightly score the edges to be cemented with a thin saw. This will give the cement something to grab onto. No. 1 ribs are from 1/4 in. medium balsa and are installed without the notches for spars. This comes later. Better cut the 1 x 1/16 in. slot in the left-hand rib for the bellcrank support. Mark center line of ribs on inside face next to crutch. This is essential for assembly. Other ribs are 1/16 in. hard "C" grain or medium 3/32 in. Cut the notches in No.'s 2 through 5. Trailing edge stock is 1/4 x 1 in., tapered to 5/32 in. at trailing edge. Notches are 3/16 in. deep. Wing tips are 1/8 in. medium with outside edges beveled top and bottom for smooth covering. Elevator is 2-1/2 in. wide, 1/8 in. hard sheet, rounded on the leading edge and tapered to a small radius on the trailing edge. The rudder is shaped to an approximate Clark Y with curved surface facing left-hand tip and set on airplane at 3°. Bellcrank support is from S-T aluminum, 1/16 in. thick.



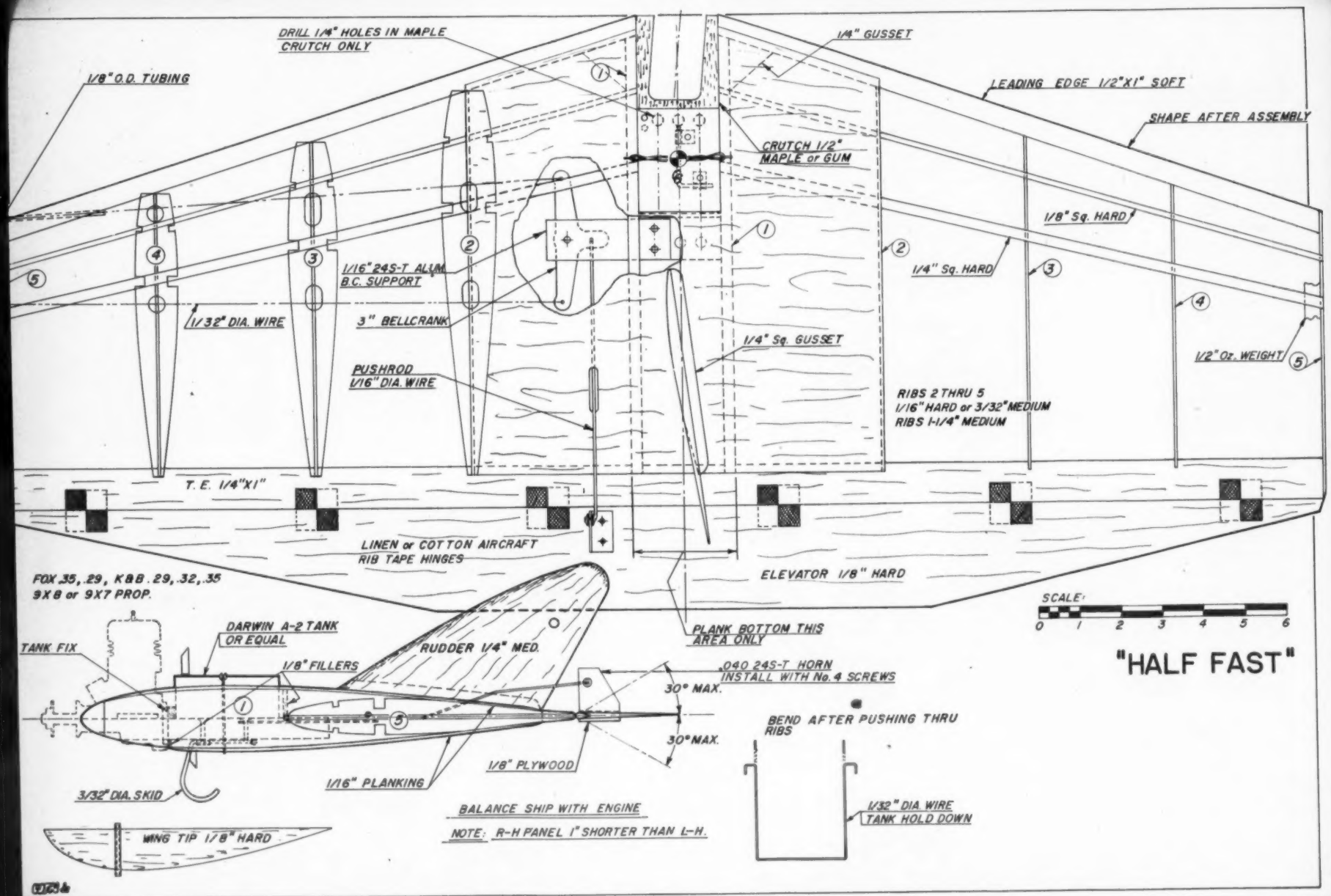
Simple construction, minimum of parts, and a rugged frame are combat musts. Delta stability a help.

If you are unable to obtain aluminum, you can fill the space from No. 1 to No. 2 ribs about 3 in. wide with 1/8 in. plywood. I like the aluminum strap because this ties the engine and tank to the lines for traditional safety.

Now for assembly. Cement No. 1 ribs to crutch, making certain top of crutch is on the center line of the ribs. You'll notice that the ribs don't come all the way to the front of the crutch. This is proper. While this cement is tacky, stick on the trailing edge and tip ribs. I now use a jig, but the first two ships were built "in the hand." You can block it up vertically and use a triangle or square to get alinement. Right now is the time to eliminate warps. Next, the 1/2 x 1 leading edges are added. Check the plans and be sure you're clear on the joints. Next add ribs, lining them up with your square. When dry, cement all joints a second time. Add the 1/4 in. square and 1/8 in. square spars, cutting the notches in No. 1 ribs with a jeweler's saw or razor blade. Drill holes for mounting skid and bend from 3/32 in. wires as shown on plans. Use flush screws on top side of crutch. Install bellcrank, lead-outs, and brass or aluminum tubes in wing tip. The line guides are brought out in the ideal position to give maximum yaw.

I use a 3 in. Veco bellcrank with pushrod in the (*Continued on page* 39)

Underneath view shows bellcrank, engine mounts. Most expendable combat planes not expendable.

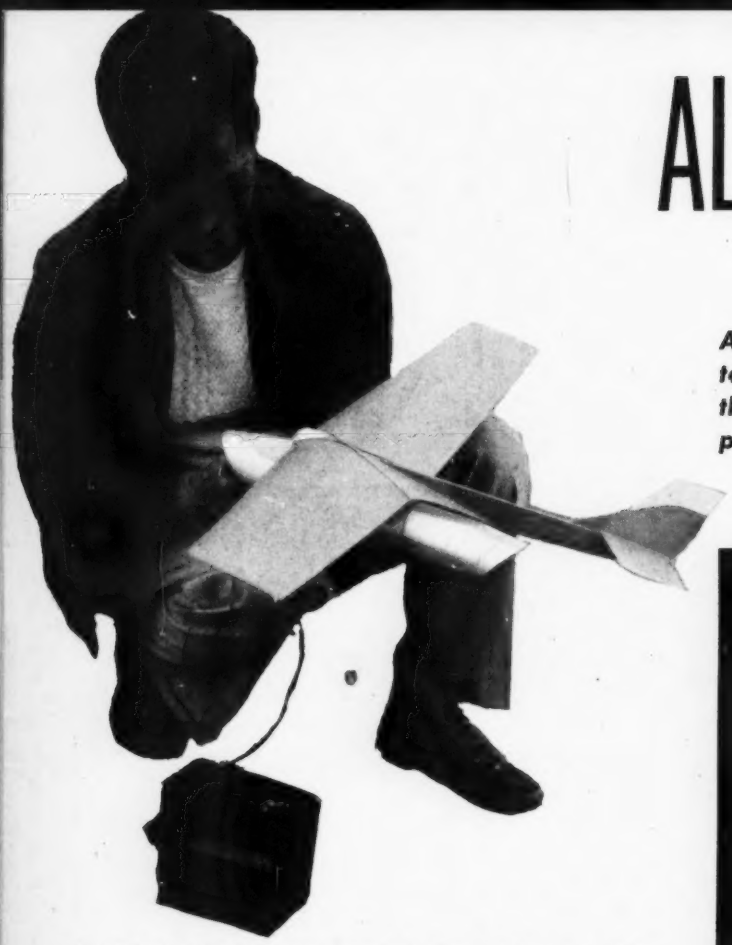


FULL SIZE PLANS AVAILABLE. SEE PAGE 40.

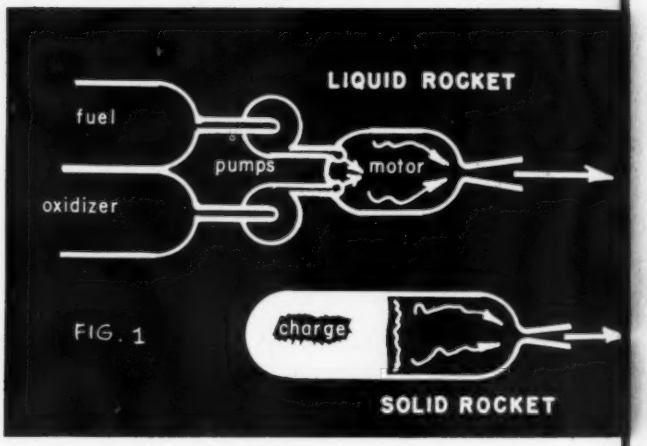
ALL ABOUT JETS

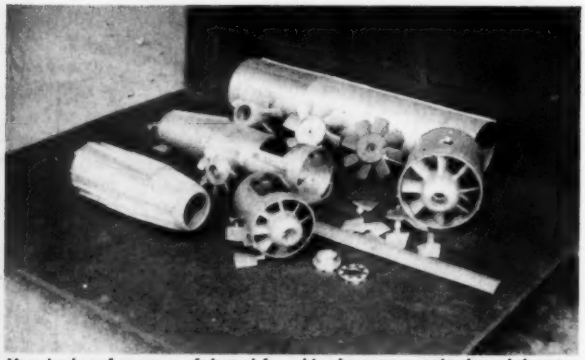
By ROBERT T. DeVAULT

An engineer with a full scale ramjet firm and a talented modeler, the author brings to this field the first authoritative discussion of reaction propulsion — how to increase model performance.



Ducted fan free flight is one of the many designs that have been flight tested successfully. Six ounces thrust produced on a .049. Easy to crank!





Marginal performance of ducted fan ukies has not promised much heretofore, but Fox .19 puts out 26 ounces thrust using "canned" ducts like these.

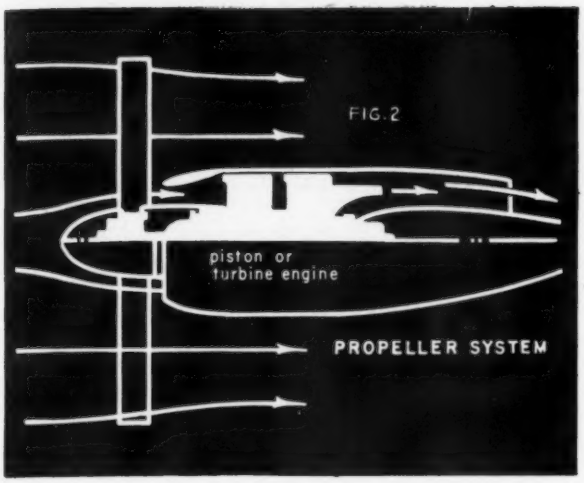
Below—A small Lockheed interceptor was an early experiment. Below, right—Big air intake of the Mig 15 lends itself to ducted fan installations.

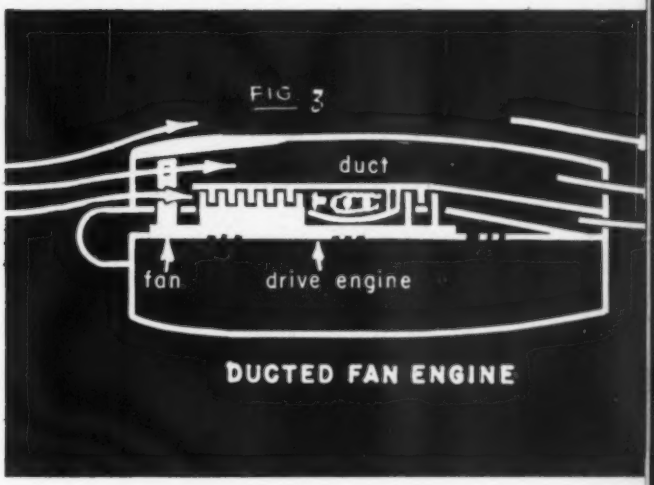
Introduction

This is the first of a series of articles designed to bring jet propulsion to model builders. Future articles will cover the existing types of model jet engines, giving their performance and their advantages and disadvantages. The author has designed and tested a series of ducted fan engines and afterburners, and methods of achieving high performance with this type of engine will be shown. This first article covers full-scale jet engines and introduces model builders to the terminology and engineering of jet propulsion.

Many times in the past I have stated firmly that model jet propulsion was completely impractical. I am now eating my words, and in this series of articles I hope to make jet propulsion appetizing for all model builders.

First of all, we have to understand a few basic physical facts. The first fact is expressed in the law of motion: "To every action there is an equal and opposite reaction." (When





Isaac Newton stated this law he was thinking of simple mechanics, though it works even in politics!). All propulsion, then, is reaction propulsion. When we walk we push against the sidewalk; when we drive a car, the car pushes against the street. Since the earth is suspended in frictionless bearings, we actually push the world in the opposite direction every time we move.

There are really only two basic types of aircraft engine. One of these, the rocket, obtains its thrust by ejecting matter in the direction opposite to its thrust. The matter used is in the form of very hot gases for economy's sake, but it could be billiard balls or brickbats. The other type of engine works on the air it flies through. It literally grabs the air and pushes it back. It may leave the air outside, in which case it is called an engine-propeller system, or it may inhale the air and eject it through an exit nozzle. This latter type may be a ramjet, turbojet, pulsejet, or ducted fan engine.

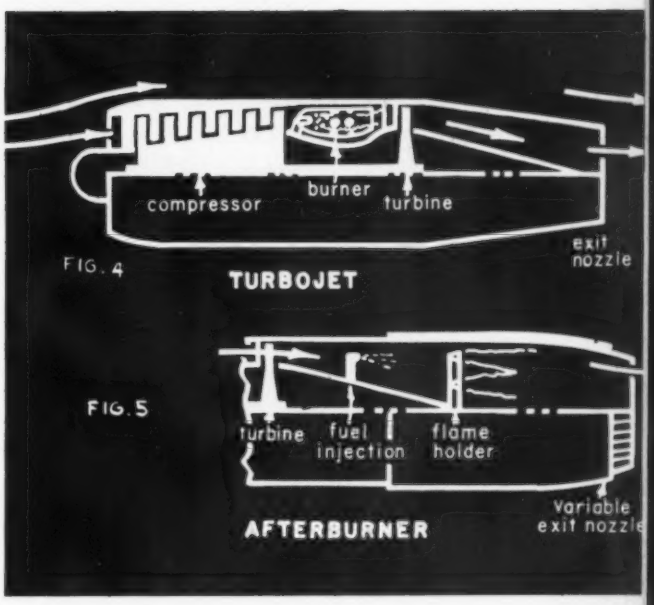
The "air-breathing" jet engine gets its oxygen for combustion directly from the air it flies through. The rocket carries its own oxygen with it, in liquid form or combined in a chemical compound. Theoretically, you could build a rocket which obtained its oxygen from the air, but then you would have something like a turbojet, and they've already been invented. Not using the oxygen from the air has some very important advantages. First, you can get it pure instead of mixed with the inert gas, nitrogen. Next, you can run your engine where there isn't any air, under water or in outer space. Finally, the engine will work the same no matter how fast it's going or how high it is.

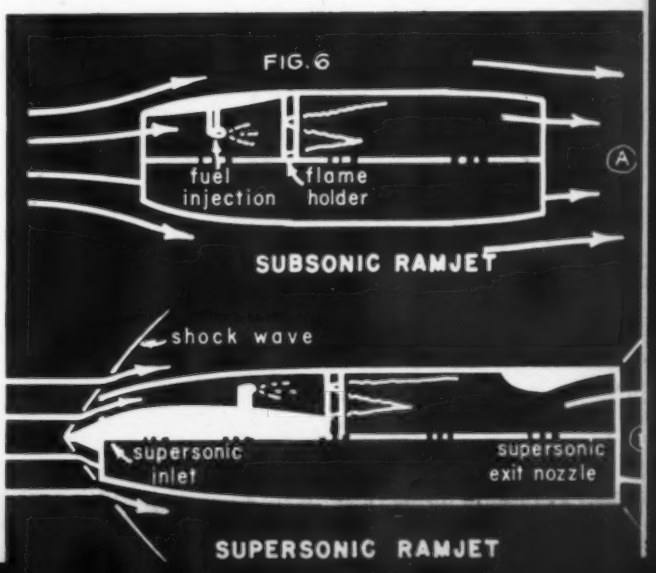
Now we are going to have to give some definitions. We all use the words "force," "work" and "power" in every-day conversation, but these words have a little different meaning in engineering. The engineering meaning of these words is given below, as precisely as I can give it.

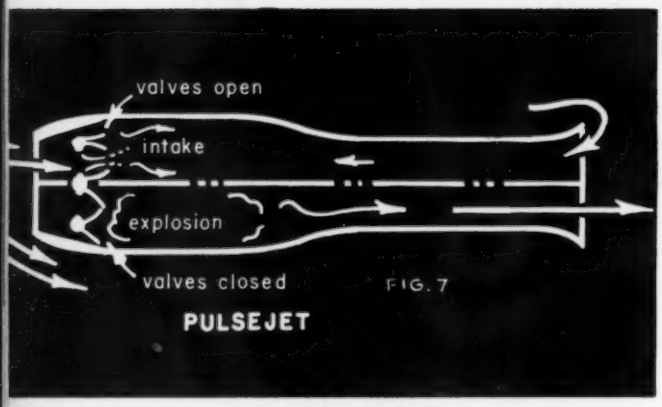
1. *Force:* This is so basic, it's almost impossible to define. When you push your car, force is what it takes. You measure it in pounds in the U.S.A.; elsewhere, in kilograms which are 2.2 times as heavy as pounds. When you have a force in a specified direction, you can give it a nice name like lift, drag, or thrust. It doesn't matter whether the object the force is being exerted on is moving or not; this just makes it hard to measure the force.

2. *Work:* Work is what you do when you exert a force over a distance. If you push the car with a 50 lb. force for 100 ft., you have done 50 x 100 or 5,000 ft.-lb. of work. Work and energy are the same thing in engineering. Note that you do no work unless you move the object you're

CONTINUED ON NEXT PAGE







ALL ABOUT JETS

pushing. We measure work or energy in terms of foot-pounds, British Thermal Units, calories, or kilowatt-hours, depending on what's most convenient for the problem in hand.

3. *Power:* Power is doing work at a certain rate. If it takes 100 seconds to push that car, the power is 5,000/100 or 50 ft.-lb. per second, which is equivalent to 9/100 hp. If you do the same work in one tenth the time, you have to use ten times as much power. Power is measured in foot-pounds per second, horsepower, kilowatts, etc. Note that when we multiply the power by the time it was exerted over, we get back to work again: horsepower-hours, kilowatt-hours, etc.

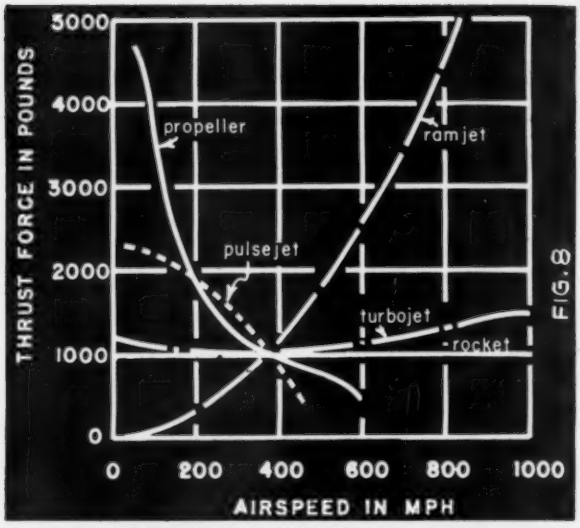
The point to this short course in physics is that the introduction of the jet engine has introduced a good deal of confusion, since we rate the engines in different terms and we can't make valid comparisons unless we talk in the same terms. A 1,000 hp engine is not equivalent to a 1,000 lb. thrust engine. To compare them, we must convert thrust to horsepower or vice-versa by taking into account the speed of the airplane. We take the thrust, multiply it by the distance and divide by the time, or more simply, multiply the thrust by the velocity. The equation is: Power (hp) = Thrust (lb.) x Speed (mph) ÷ 375. The 375 is there to get all the terms in the right units. So then: At 375 mph, 1,000 lb. of thrust is the same as 1,000 hp; at 30 mph, 1,000 lb. of thrust is equivalent to only 80 hp, and at 1,000 mph, 1,000 lb. of thrust produces 2,670 hp.

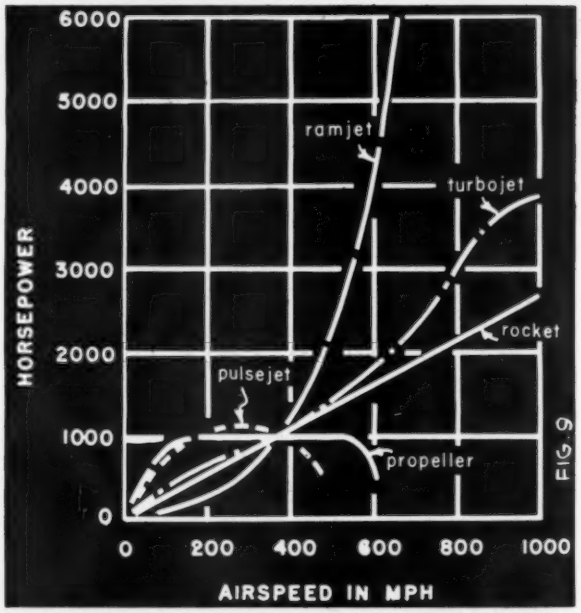
We rate engines in different terms for convenience only. We use the terms which are most nearly constant over the range of engine operating conditions. With rockets and turbojets, it's thrust; with propeller engines, it's horsepower. With ramjets, it's neither: we have to use another quantity called a thrust co-efficient. (This is analogous to lift and drag co-efficients, with which some of you are already familiar.)

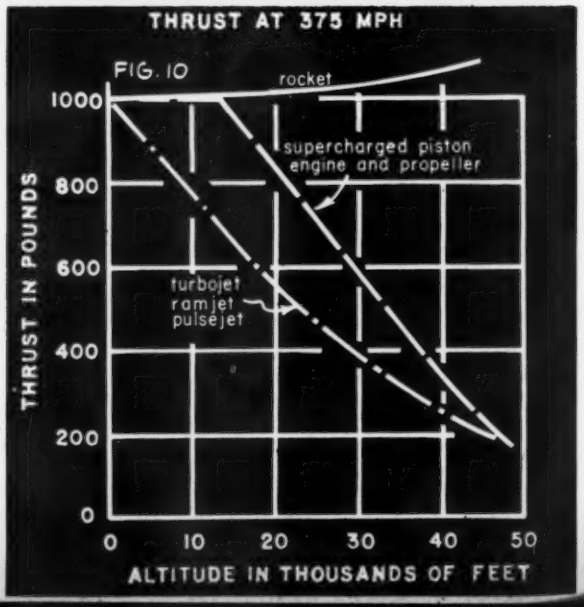
So much for the introduction; now let's examine the various engines and see what goes on inside of them. The more important (we'll have to stick to the common engines: there are many engines which are combinations of the basic ones) engines are: 1. Rockets (Fig. 1); 2. Propeller engines (piston or turbine) (Fig. 2); 3. Ducted fans (Fig. 3); 4. Turbojets (Fig. 4); 5. Turbojets with Afterburners (Fig. 5); 6. Ramjets (Fig. 6); 7. Pulsejets (Fig. 7).

Now look at the engine diagrams in Figs. 1 through 7. They've been prepared to show as well as possible how each engine operates, where the air goes, where the combustion is, etc.

Fig. 1 shows the two kinds of rocket engines, the liquid propellant rocket and the solid propellant rocket. In the liquid propellant rocket, fuel and oxidizer are sprayed into a combustion chamber, mixed and burned, and ejected out the supersonic exit nozzle. The pressure in the combustion chamber is usually around 300 psi (*Continued on page 48*)







GADFLY

By SHERMAN GILLESPIE

All planes, big or little, suffer performance penalty from excess weight. Beginners hoping to build contest free flight will learn much here.

Charming little rubber powered, semi-scale model of historic light plane rewards neat builders with wonderful flights.

The Gadfly is a semi-scale model of the Glenny & Henderson plane that was flying in England in 1929. Powered by a 2 cyl., 40 hp engine, the little single-seater cruised at 72 mph. Top speed was 91 mph and it landed at 45 mph. Its ceiling was 13,000 ft. In its day it was quite an efficient machine.

The model is a very realistic flier with a phenomenal glide. It can do up to 30 seconds, hand-wound, in cool evening air. Warm air tests gave many flights of from 40 to 57 seconds. The ship shown was lost after a spectacular flight of 2 minutes 34 seconds! This, of course, was the result of a thermal but, when last seen high over a cherry orchard, the little job was soaring beautifully.

Construction is conventional but use care to keep the weight down. Complete flying weight should be approximately .8 oz.

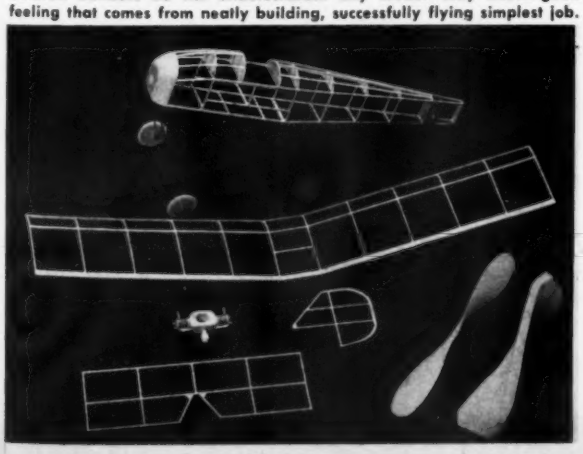
Build the fuselage sides from medium hard 1/16 square balsa. Set the sides up over the top view and put in the 1/16 square cross-pieces. Cement the formers directly to these cross-pieces. Formers No.'s 1, 3 and 4 are cut from 1/16 sheet and are notched to receive the ends of the stringers. Formers No.'s 2, 5, 6, 7, 8 and 9 are cut from 1/32 sheet. The stringers are spaced and cemented on without notching these 1/32 formers.

Cut the nose block from fairly soft 1/2 in. stock and drill it to receive the 3/8 in. shaft of the thrust button. Although a hardwood button was used, a laminated balsa or plastic type may be fitted satisfactorily.

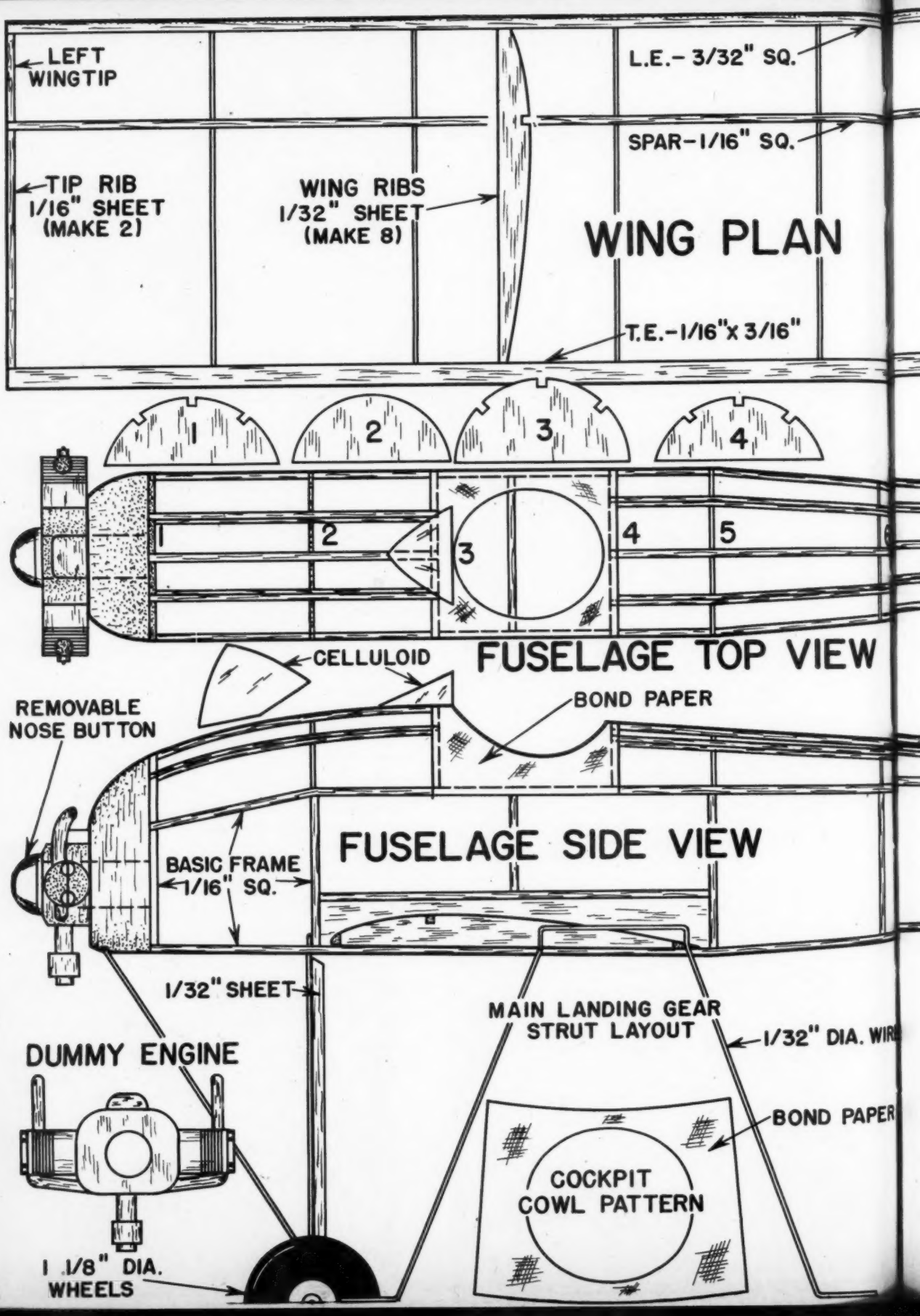
The dummy engine is not necessary for a strictly flying model. If it is left off, however, heavier wheels may be needed to balance the model properly. (*Continued on page 36*)

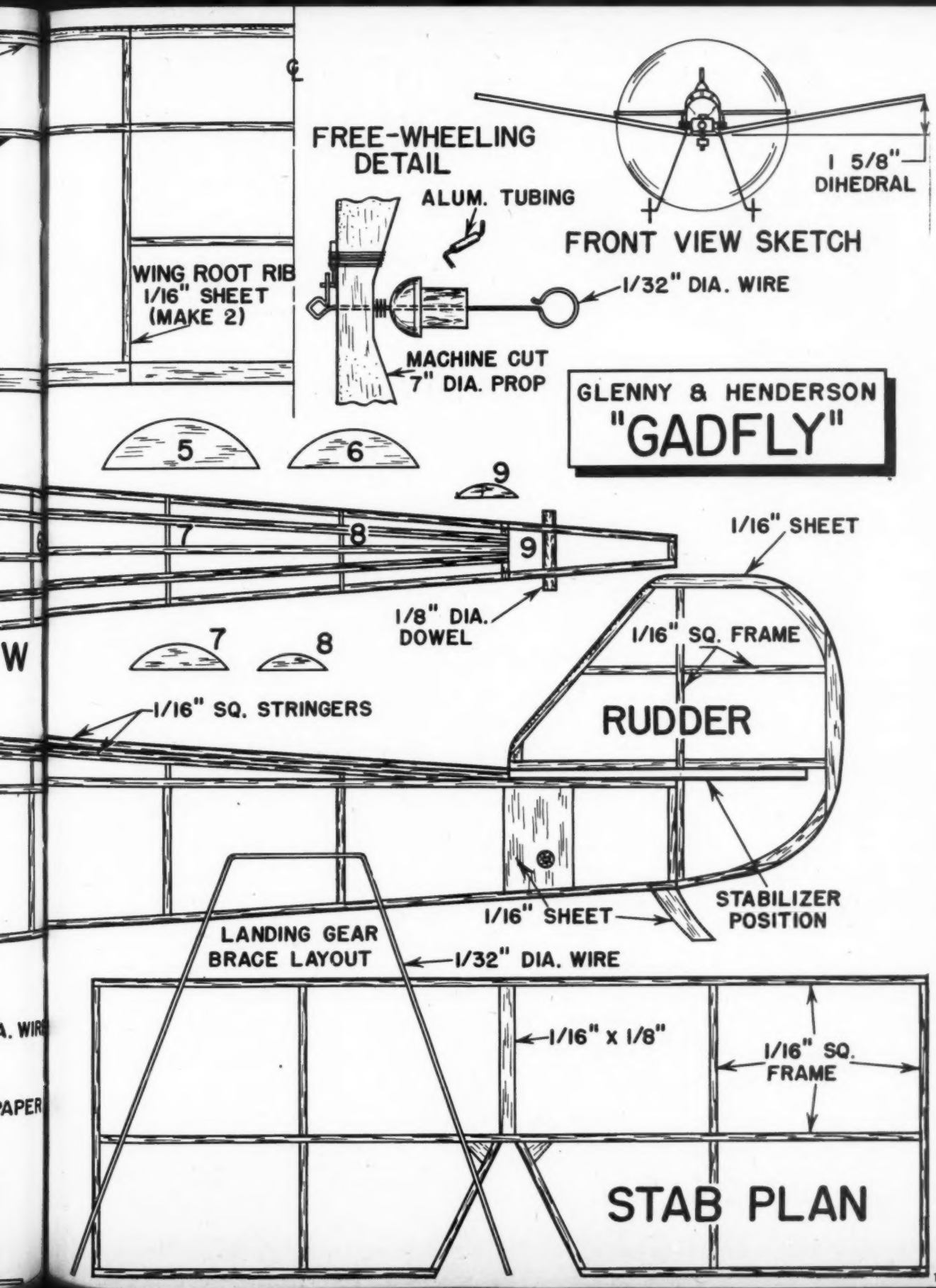
SEE PLANS ON FOLLOWING TWO PAGES

Veteran builders do not underestimate any model—they know good feeling that comes from neatly building, successfully flying simplest job.



Today's arm-and-a-leg prices shouldn't stop you junior balsa hackers from building this. If you hoard scraps, you can still go Saturday movie.


LEFT WINGTIP
L.E.- 3/32" SQ.
SPAR- 1/16" SQ.
TIP RIB 1/16" SHEET (MAKE 2)
WING RIBS 1/32" SHEET (MAKE 8)
WING PLAN
T.E.- 1/16" x 3/16"
1
2
3
4
1
2
3
4
5
FUSELAGE TOP VIEW
CELLULOID
BOND PAPER
REMOVABLE NOSE BUTTON
FUSELAGE SIDE VIEW
BASIC FRAME 1/16" SQ.
1/32" SHEET
MAIN LANDING GEAR STRUT LAYOUT
1/32" DIA. WIRE
DUMMY ENGINE
BOND PAPER
COCKPIT COWL PATTERN
1 1/8" DIA. WHEELS

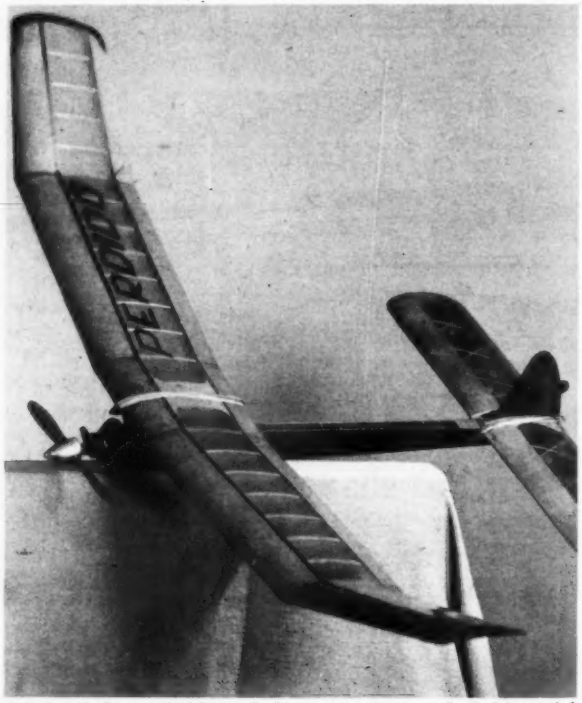

FREE-WHEELING DETAIL
ALUM. TUBING
1/32" DIA. WIRE
MACHINE CUT 7" DIA. PROP
WING ROOT RIB 1/16" SHEET (MAKE 2)
1 5/8" DIHEDRAL
FRONT VIEW SKETCH
GLENNY & HENDERSON
"GADFLY"
5
6
7
8
9
1/16" SHEET
1/8" DIA. DOWEL
1/16" SQ. FRAME
1/16" SQ. STRINGERS
RUDDER
STABILIZER POSITION
1/16" SHEET
LANDING GEAR BRACE LAYOUT
1/32" DIA. WIRE
1/16" x 1/8"
1/16" SQ. FRAME
STAB PLAN

PERDIDO...

By GARY CHRISTIANSEN

Free flighters who really know how to build airplanes will find this definitely hot airplane does excellent job of handling power. For the .19's.

Perdido was evolved from earlier Perfidio design and is able to beat the older ship consistently, states designer, shown here with newer craft.



Ship has 0 degrees incidence, 1 degree negative in stab, 2 degrees left thrust, 1/4 in. wash-in left inboard panel, stab tilt for left glide.

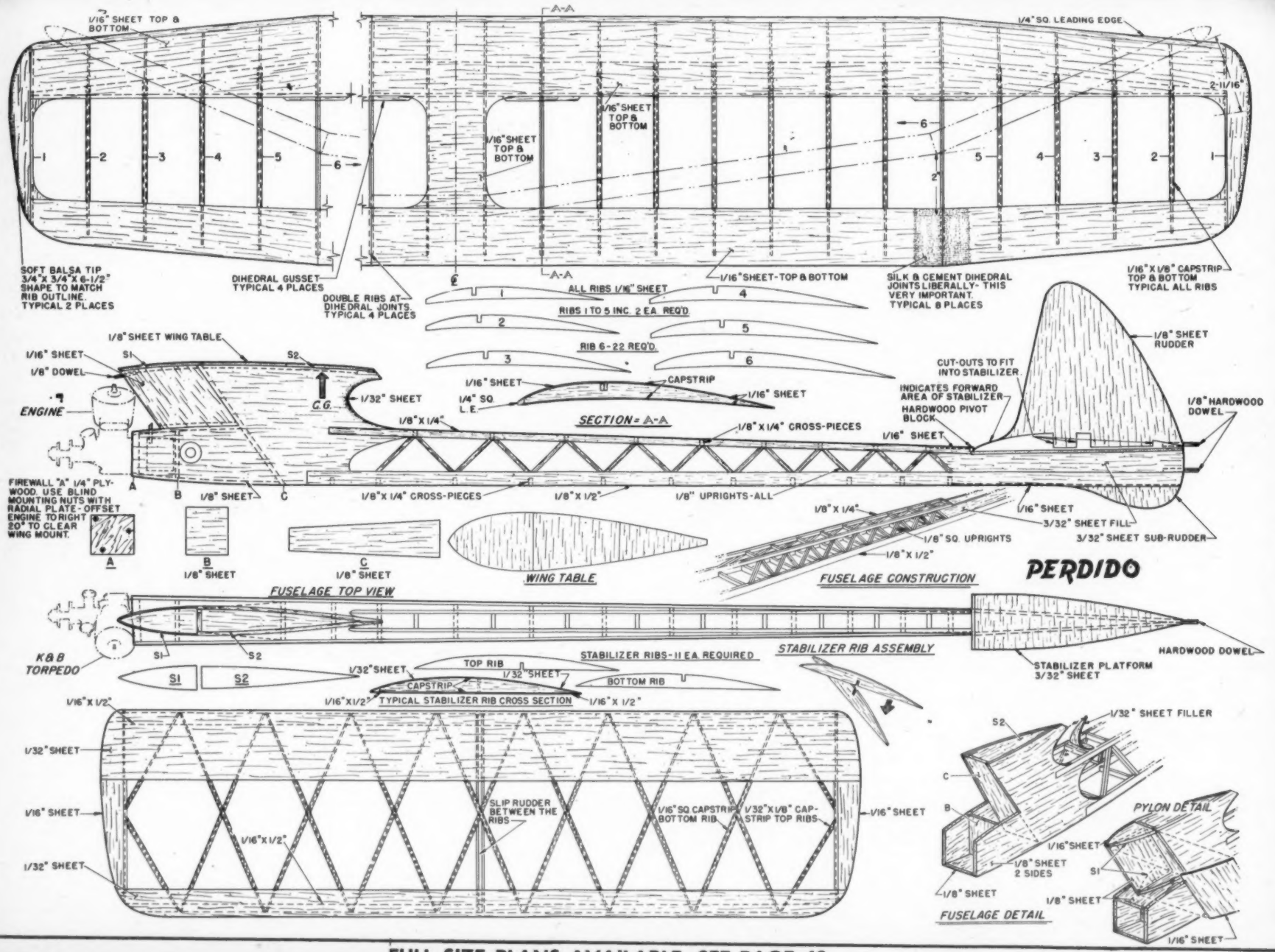
▶ The Perdido was conceived and built while I was at Annapolis, but I didn't get a chance to do any flying with it until I transferred to Harvard and came home for the summer. After three months of flying, the Perdido has undergone drastic revision in its force arrangement in the process of my trying to work out some ideas about controlling power in a small, fast ship. This revision, it seems to me, is the significant difference between a drawing board model and a ship more valuable for having had its bugs flown (and in this case, literally rebuilt) out of it. The upshot of it all is a much more docile airplane than one would expect of a rather small (466 sq. in.) and a very fast ship. With a good .19 the ship really moves out, yet handles surprisingly well and isn't oversensitive to adjustment.

Money difficulties limit a student's contest traveling; consequently, the only contests to which I've taken the Perdido have been local Intermountain area meets. In Idaho, the ship won first place in contests at Pocatello and Twin Falls. In Utah I've mainly used my B-C ship in the large class flight events. Partly because I haven't had a chance to do more traveling with the Perdido, I'm more concerned here with what the ship *is* as a design than with the as yet limited results of what it has done.

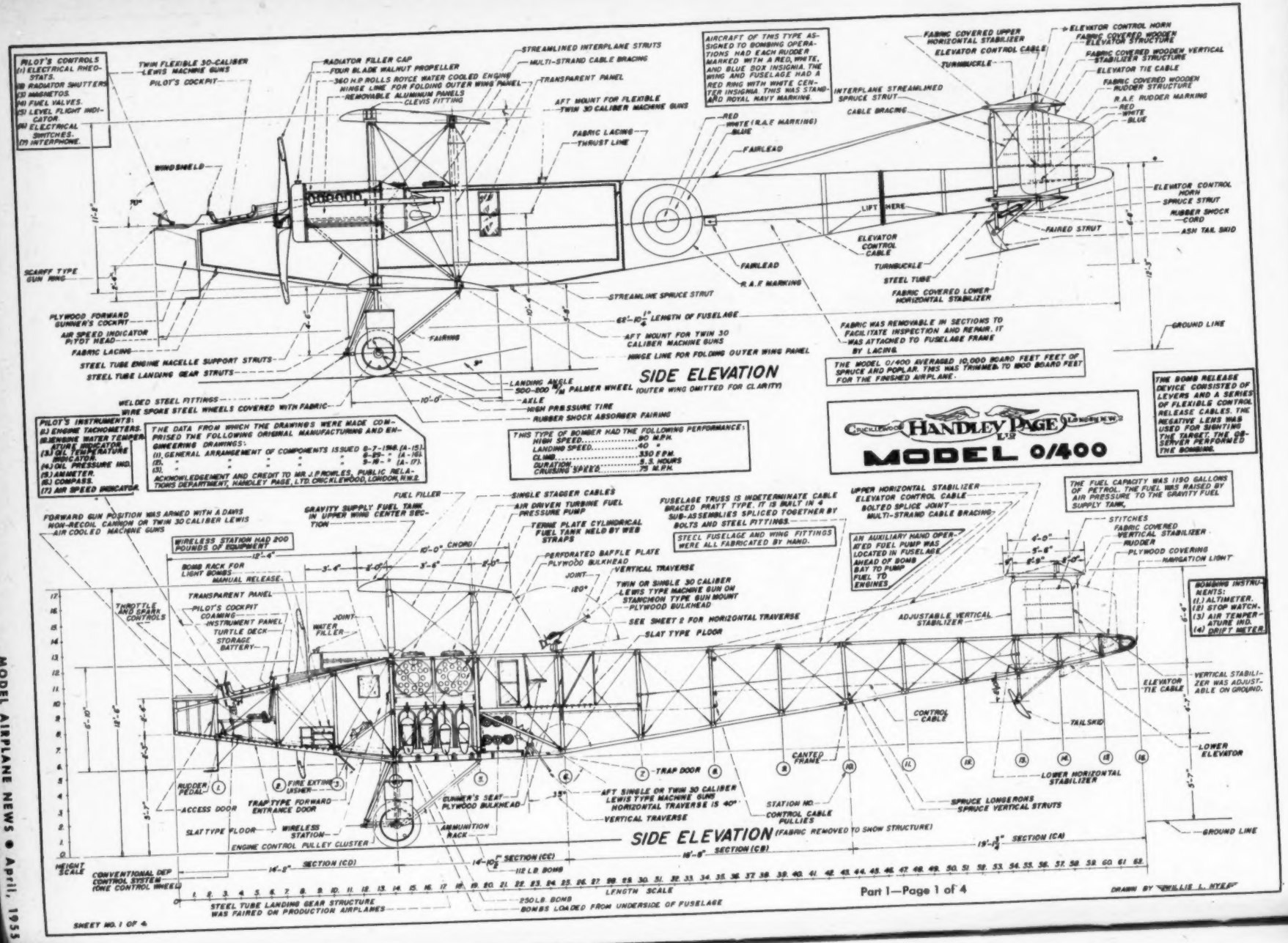
Intended in the original Perdido set-up was a method of controlling the looping tendency concomitant with high speed by using a large dose (8°) of stab incidence with adequate angular difference for recovery, giving the wing 9° with the airfoil used. I was confident that with such an arrangement I could hold the nose almost horizontal under full power if I wanted to.

'Twasn't so. Loops. Many violent ones. Conclusion was that wing position and incidence were largely responsible. I decided that the wing was taking the full blast of the prop stream along with the stab—only at greater angle of attack and with greater area for the prop blast to impinge upon. This reasoning quite simply explained the looping and led to the important idea behind the present Perdido. I decided to rebuild the fuselage to use the wing at 0° and set the stab at 1° negative. The idea is that the prop stream passing the wing at 0° induces as little looping tendency as possible from its impinging on the undersurface. The salient parts of the rest of the approach are a conservative combination of rudder area, dihedral and tail moment. Stab area is dictated by incidence and CG position desired and is really smaller than I prefer.

It's easier if I avoid saying anything about airfoils, but the temptation to explain what I've used in the Perdido is too great. You will notice that the sections shown are, as I term them, just curves. True, the one in the wing is undercambered and 6409-ish, but they're still just curves, and they're that way because I've lost a lot of faith in the importance of exactly plotted airfoils. I don't mean to imply that just any section will do the job as well as any other, (*Continued on page 34*)



FULL SIZE PLANS AVAILABLE. SEE PAGE 40.


PILOT'S CONTROLS
(1) ELECTRICAL RHEOSTATS.
(2) RADIATOR SHUTTERS
(3) MAGNETOS.
(4) FUEL VALVES.
(5) LEVEL FLIGHT INDICATOR.
(6) ELECTRICAL SWITCHES.
(7) INTERPHONE.
TWIN FLEXIBLE 30-CALIBER LEWIS MACHINE GUNS
PILOT'S COCKPIT
WINDSHIELD
RADIATOR FILLER CAP
FOUR BLADE WALNUT PROPELLER
340 H.P. ROLLS ROYCE WATER COOLED ENGINE
HINGE LINE FOR FOLDING OUTER WING PANEL
REMOVABLE ALUMINUM PANELS
CLEVIS FITTING
STREAMLINED INTERPLANE STRUTS
MULTI-STRAND CABLE BRACING
TRANSPARENT PANEL
AFT MOUNT FOR FLEXIBLE TWIN 30 CALIBER MACHINE GUNS
FABRIC LACING
THRUST LINE
AIRCRAFT OF THIS TYPE ASSIGNED TO BOMBING OPERATIONS HAD EACH RUDDER MARKED WITH A RED, WHITE, AND BLUE BOX INSIGNIA. THE WING AND FUSELAGE HAD A RED RING WITH WHITE CENTER INSIGNIA. THIS WAS STANDARD ROYAL NAVY MARKING.
RED
WHITE (R.A.F. MARKING)
BLUE
FAIRLEAD
FABRIC COVERED UPPER HORIZONTAL STABILIZER
ELEVATOR CONTROL CABLE
TURNBUCKLE
ELEVATOR CONTROL HORN
FABRIC COVERED WOODEN ELEVATOR STRUCTURE
FABRIC COVERED WOODEN VERTICAL STABILIZER STRUCTURE
ELEVATOR TIE CABLE
FABRIC COVERED WOODEN RUDDER STRUCTURE
R.A.F. RUDDER MARKING
RED
WHITE
BLUE
INTERPLANE STREAMLINED SPRUCE STRUT
CABLE BRACING
LIFT HERE
ELEVATOR CONTROL HORN
SPRUCE STRUT
RUBBER SHOCK CORD
ASH TAIL SKID
FAIRED STRUT
ELEVATOR CONTROL CABLE
TURNBUCKLE
STEEL TUBE
FABRIC COVERED LOWER HORIZONTAL STABILIZER
GROUND LINE
SCARFF TYPE GUN RING
PLYWOOD FORWARD GUNNER'S COCKPIT
AIR SPEED INDICATOR PITOT HEAD
FABRIC LACING
STEEL TUBE ENGINE NACELLE SUPPORT STRUTS
STEEL TUBE LANDING GEAR STRUTS
WELDED STEEL FITTINGS
WIRE SPOKE STEEL WHEELS COVERED WITH FABRIC
FAIRING
STREAMLINE SPRUCE STRUT
62'-10 1/4" LENGTH OF FUSELAGE
AFT MOUNT FOR TWIN 30 CALIBER MACHINE GUNS
HINGE LINE FOR FOLDING OUTER WING PANEL
LANDING ANGLE
500-600 x 90 PALMER WHEEL
AXLE
HIGH PRESSURE TIRE
RUBBER SHOCK ABSORBER FAIRING
SIDE ELEVATION
(OUTER WING OMITTED FOR CLARITY)
FABRIC WAS REMOVABLE IN SECTIONS TO FACILITATE INSPECTION AND REPAIR. IT WAS ATTACHED TO FUSELAGE FRAME BY LACING.
THE MODEL 0/400 AVERAGED 10,000 BOARD FEET FEET OF SPRUCE AND POPLAR. THIS WAS TRIMMED TO 6000 BOARD FEET FOR THE FINISHED AIRPLANE.
THE BOMB RELEASE DEVICE CONSISTED OF LEVERS AND A SERIES OF FLEXIBLE CONTROL RELEASE CABLES. THE NEGATIVE LENS WAS USED FOR SIGHTING THE TARGET. THE OBSERVER PERFORMED THE BOMBING.
PILOT'S INSTRUMENTS:
(1) ENGINE TACHOMETERS.
(2) ENGINE WATER TEMPERATURE INDICATOR.
(3) OIL TEMPERATURE INDICATOR.
(4) OIL PRESSURE IND.
(5) AMMETER.
(6) COMPASS.
(7) AIR SPEED INDICATOR.
THE DATA FROM WHICH THE DRAWINGS WERE MADE COMPRISED THE FOLLOWING ORIGINAL MANUFACTURING AND ENGINEERING DRAWINGS:
(1). GENERAL ARRANGEMENT OF COMPONENTS ISSUED 6-7-1918. (A-15).
(2). " " " " " 6-29- " (A-16).
(3). " " " " " 9-10- " (A-17).
ACKNOWLEDGEMENT AND CREDIT TO MR. J. P. ROWLES, PUBLIC RELATIONS DEPARTMENT, HANDLEY PAGE, LTD. CRICKLEWOOD, LONDON, N.W.2.
THIS TYPE OF BOMBER HAD THE FOLLOWING PERFORMANCE:
HIGH SPEED..... 90 M.P.H.
LANDING SPEED..... 40 "
CL. IMB..... 330 F.P.M.
DURATION..... 5.5 HOURS
CRUISING SPEED..... 75 M.P.H.
HANDLEY PAGE LTD
MODEL 0/400
FORWARD GUN POSITION WAS ARMED WITH A DAVIS NON-RECOIL CANNON OR TWIN 30 CALIBER LEWIS AIR COOLED MACHINE GUNS
WIRELESS STATION HAD 200 POUNDS OF EQUIPMENT
GRAVITY SUPPLY FUEL TANK IN UPPER WING CENTER SECTION
FUEL FILLER
SINGLE STAGGER CABLES
AIR DRIVEN TURBINE FUEL PRESSURE PUMP
TERNE PLATE CYLINDRICAL FUEL TANK HELD BY WEB STRAPS
FUSELAGE TRUSS IS INDETERMINATE CABLE BRACED PRATT TYPE. IT IS BUILT IN 4 SUB-ASSEMBLIES SPLICED TOGETHER BY BOLTS AND STEEL FITTINGS.
STEEL FUSELAGE AND WING FITTINGS WERE ALL FABRICATED BY HAND.
UPPER HORIZONTAL STABILIZER
ELEVATOR CONTROL CABLE
BOLTED SPLICE JOINT
MULTI-STRAND CABLE BRACING
THE FUEL CAPACITY WAS 1190 GALLONS OF PETROL. THE FUEL WAS RAISED BY AIR PRESSURE TO THE GRAVITY FUEL SUPPLY TANK.
AN AUXILIARY HAND OPERATED FUEL PUMP WAS LOCATED IN FUSELAGE AHEAD OF BOMB BAY TO PUMP FUEL TO ENGINES.
STITCHES
FABRIC COVERED VERTICAL STABILIZER
RUDDER
PLYWOOD COVERING
NAVIGATION LIGHT
BOMBING INSTRUMENTS:
(1.) ALTIMETER.
(2) STOP WATCH.
(3) AIR TEMPERATURE IND.
(4) DRIFT METER.
BOMB RACK FOR LIGHT BOMBS MANUAL RELEASE.
10'-0" CHORD
12'-4"
3'-6"
5'-0"
3'-6"
5'-0"
PERFORATED BAFFLE PLATE
PLYWOOD BULKHEAD
VERTICAL TRAVERSE
JOINT
180°
TWIN OR SINGLE 30 CALIBER LEWIS TYPE MACHINE GUN ON STARBOARD TYPE GUN MOUNT
PLYWOOD BULKHEAD
SEE SHEET 2 FOR HORIZONTAL TRAVERSE
SLAT TYPE FLOOR
TRANSPARENT PANEL
PILOT'S COCKPIT COAMING
INSTRUMENT PANEL
TURTLE DECK
STORAGE BATTERY
THROTTLE AND SPARK CONTROLS
WATER FILLER
JOINT
ADJUSTABLE VERTICAL STABILIZER
ELEVATOR TIE CABLE
VERTICAL STABILIZER WAS ADJUSTABLE ON GROUND.
CONTROL CABLE
TAILSKID
LOWER ELEVATOR
CANTED FRAME
LOWER HORIZONTAL STABILIZER
SPRUCE LONGERONS
SPRUCE VERTICAL STRUTS
RUDDER PEDAL
FIRE EXTINGUISHER
ACCESS DOOR
TRAP TYPE FORWARD ENTRANCE DOOR
GUNNER'S SEAT PLYWOOD BULKHEAD
TRAP DOOR
AFT SINGLE OR TWIN 30 CALIBER LEWIS TYPE MACHINE GUNS HORIZONTAL TRAVERSE IS 40°
VERTICAL TRAVERSE
STATION NO.
CONTROL CABLE PULLIES
SLAT TYPE FLOOR
WIRELESS STATION
AMMUNITION RACK
ENGINE CONTROL PULLEY CLUSTER
SIDE ELEVATION (FABRIC REMOVED TO SHOW STRUCTURE)
SECTION (CA)
SECTION (CB)
SECTION (CC)
SECTION (CD)
16'-6"
19'-1 1/4"
14'-10 5/8"
14'-8"
112 LB. BOMB
250 LB. BOMB
BOMBS LOADED FROM UNDERSIDE OF FUSELAGE
HEIGHT SCALE
LENGTH SCALE
CONVENTIONAL DEP CONTROL SYSTEM (ONE CONTROL WHEEL)
STEEL TUBE LANDING GEAR STRUCTURE WAS FAIRED ON PRODUCTION AIRPLANES
SHEET NO. 1 OF 4.
Part 1—Page 1 of 4
DRAWN BY "WILLIS L. HYER"

BOMBS LOADED FROM UNDERSIDE OF FUSELAGE

Part 1—Page 1 of 4

DRAWN BY WILLIS L. NYE

CONSTRUCTION OF THE INITIAL PROTOTYPE TWIN ENGINE BIPLANE WHICH DEVELOPED INTO THE MODEL O/400 STARTED DECEMBER 1914. THIS BIPLANE WAS POWERED WITH TWO SUNBEAM 150 H.P. ENGINES. THE BOMB LOAD WAS 6 WISSLES OF 112 POUNDS. THESE AIRPLANES WERE BUILT TO THE ORDER OF THE BRITISH ADMIRALTY.

THE NEXT DEVELOPEMENT OF THIS AIRPLANE WAS THE MODEL O/100. THIS AIRPLANE WAS POWERED WITH TWO 250 H.P. WATER COOLED ENGINES. WHEREAS THE INITIAL PROTOTYPE HAD AN ARMORED FUEL AND PARTIALLY ARMORED CREW AREA, MODEL O/400 WAS NOT ARMORED. THE HIGH SPEED WAS 97 M.P.H. WITH 2000 POUNDS OF BOMBS ABOARD. FORTY MODEL O/100 WERE BUILT FOR ROYAL NAVAL AIR SERVICE. THE INITIAL TEST FLIGHT WAS MADE DECEMBER 18TH 1915.

THE MODEL O/400 WAS A DIRECT DEVELOPEMENT OF THE MODEL O/100. IN EXCESS OF 400 MODEL O/400 WERE BUILT PRIOR TO THE END OF WORLD WAR I. THE FIRST EFFICIENT BOMB RELEASE SYSTEM WAS INSTALLED ON THIS BOMBER.

A MODEL O/100 MADE AN INADVERTENT FORCED LANDING BEHIND THE GERMAN LINES. IT FUNCTIONED AS A DESIGN GUIDE FOR THE FAMED GOTHA BOMBER AND OTHER LARGE GERMAN WARPLANES.

THE MODEL O/400 COULD FLY AND MAINTAIN ALTITUDE ON A SINGLE ENGINE.

FULLY ARMED, THE MODEL O/400 COULD CARRY 6 MACHINE GUNS, 6 CREWMEN, 5,000 POUNDS OF BOMBS, FOR SHORT RANGE OPERATIONS. NORMAN LOAD AT TAKE-OFF WAS 11,500 POUNDS. THE EMPTY WEIGHT WAS 6,550 POUNDS. THIS BOMBER ESTABLISHED SEVERAL LOAD LIFTED AND DISTANCE WORLD RECORDS.

IN WORLD WAR I, THE STANDARD AIRCRAFT CORPORATION OF ELIZABETH, NEW JERSEY WAS LICENSED TO BUILD THE MODEL O/400 FOR THE U.S. ARMY. FACTORY PRODUCTION STARTED MARCH 29, 1918. THE FIRST PRODUCTION BOMBER FLEW JULY 1, 1918. THIS AIRPLANE EXHIBITED IMPROVED FLIGHT PERFORMANCE WITH A MAXIMUM GROSS WEIGHT OF 11,791 POUNDS. THIS WAS CHRISTENED THE "LANGLEY". THE BOMBER WAS POWERED BY TWO 400 H.P. LIBERTY ENGINES. 107 MODEL O/400 BOMBERS WERE BUILT AND CRATED FOR OVERSEAS SHIPMENT PRIOR TO THE ARMISTICE NOVEMBER 11TH 1918. THESE AMERICAN BUILT HANDLEY PAGE BOMBERS WERE EVENTUALLY ALL SCRAPPED, ALTHOUGH THE "LANGLEY" REMAINED IN LIMITED FLIGHT STATUS AFTER WORLD WAR I FOR ABOUT 4 YEARS.

ALTHOUGH THE FIRST BATCH OF BOMBERS WERE CRATED FOR OCEAN SHIPMENT, BY THE INSTALLATION OF ADDITIONAL FUEL TANKS IN THE BOMB BAY AND FUEL TANKS IN THE FUSELAGE, TRANSATLANTIC AIR FERRY FLIGHTS NON-STOP TO ENGLAND WOULD HAVE BEEN POSSIBLE.

THE FIRST BOMBER OF THIS TYPE REACHED THE WAR FRONT IN NOVEMBER 1916. THE MODEL O/400 WAS PLACED IN PRODUCTION IN APRIL 1918. THIS IMPROVED VERSION HAD A RANGE OF 600 MILES WITH A 2000 POUND BOMB LOAD AND A CREW OF 7. THESE AIRCRAFT WERE ALSO FLOWN ON THE MIDDLE EAST WAR FRONT IN 1918. DURING THE AFRICAN WAR AFTER W.W.I, R.A.F. HANDLEY PAGE MODEL O/400 PARTICIPATED. SEVERAL OF THESE BOMBERS WERE CONVERTED TO COMMERCIAL PASSENGER AIRLINERS AND COMPRISED THE FORERUNNER OF MODERN BRITISH AIRLINER DESIGN. THE MODEL O/400 WAS THE FIRST SUCCESSFUL MULTI-ENGINED LARGE BOMBER.

WING CELLULE

AFT VIEW OF TAIL

PLAN VIEW

COLORATION
TOP WING.....OLIVE DRAB
BOTTOM WING..OLIVE DRAB
FUSELAGE.....OLIVE DRAB
TAIL SURFACES..OLIVE DRAB
LANDING GEAR.....BLACK
WHEELS.....SILVER
TIRES.....BLACK

THE ELECTRICAL SYSTEM CONSISTED OF TWO SIX VOLT WIND-DRIVEN GENERATORS.

THE WIRELESS EQUIPMENT WAS ENERGIZED BY A WIND DRIVEN DYNAMOTOR.

THIS AIRPLANE COULD ALSO BE FITTED WITH CAMERAS FOR PHOTO MISSIONS WHEN DESIRED. THE CAMERAS WERE SLUNG IN THE BOMB BAY.

OVERALL HEIGHT OF THE AIRPLANE WHEN THE WINGS ARE FOLDED IS 17'-6".

RUDDER CENTERS ARE 15'-5" APART

ACKNOWLEDGEMENT TO PETER M. GROSZ, ROSEDALE ROAD, PRINCETON, NEW JERSEY WHO SUPPLIED CERTAIN TECHNICAL DATA FROM HIS W.W.I. COLLECTION.

SHEET NO.3 OF 4.

Part 1—Page 2 of 4

DRAWN BY WILLIS L. NYE

Author gets set for a radio controlled run. An ED clock-work boat type escapement was used.

Shoreboat

Churning along serenely on a Cameron water-cooled marine engine, Shoreboat is real as real can be.

Something different in RC boats is this friendly water taxi, or 25-cents-a-ride excursion boat. Excellent directions make it easy to build. Tether, too.

By R. L. BROWN

▸ The Shoreboat was designed along the lines of the various water taxies and "25¢ a ride" excursion boats, found almost any place where large bodies of water and people get together. If you haven't tried your hand at boats before, you will find the Shoreboat is quite easy to build, and whether run free, tethered or radio controlled, it will provide many hours of fun and excitement, so grab a handful of lumber and let's go.

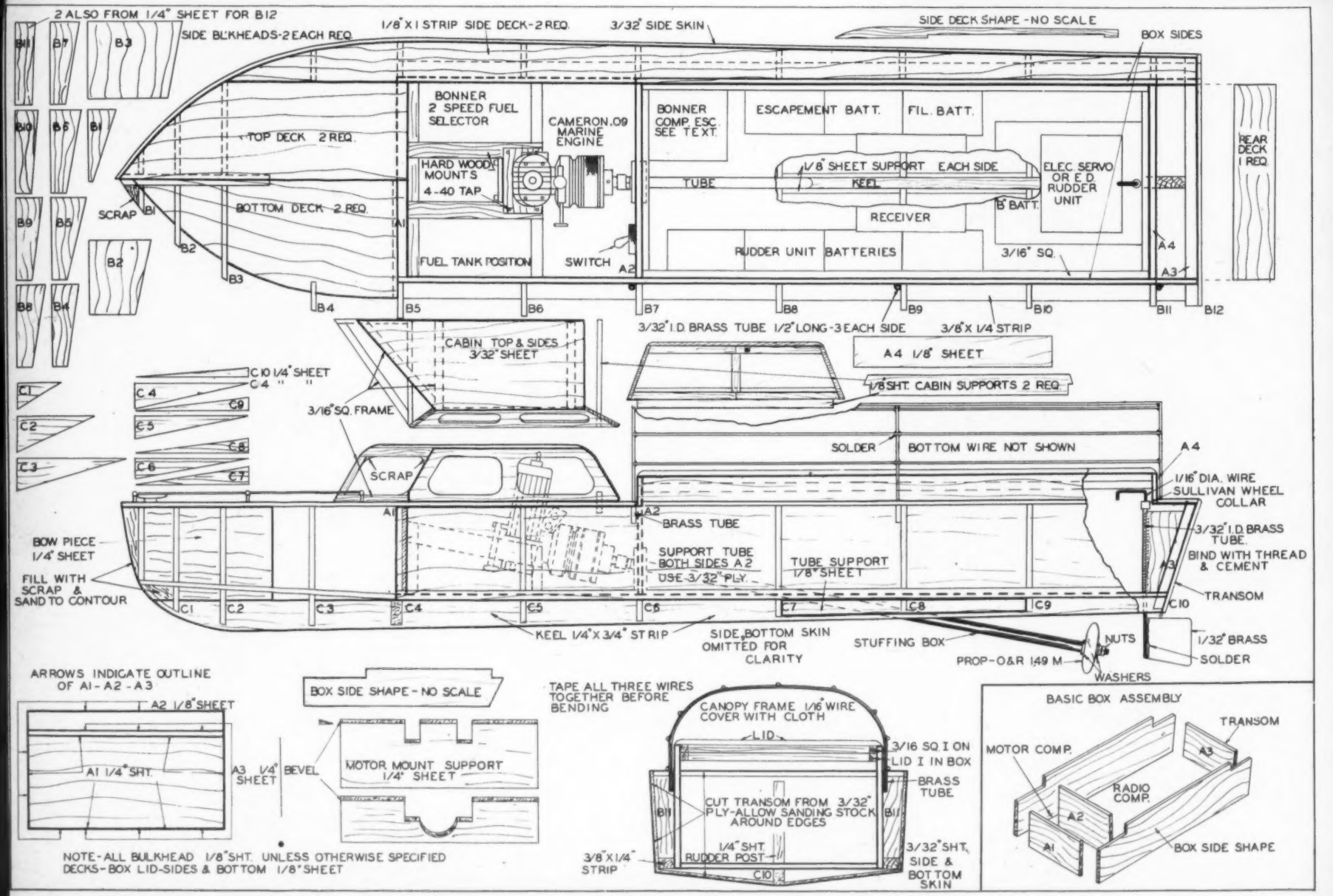
The entire boat can be "built in the air" and, in order to preserve the plans, it is advisable to do so. First, draw outline of the basic structure on a piece of shelf paper, tack to work board and cover with wax paper. This outline should be 18-1/2 x 5-3/4 in. Now cut out the following pieces: two 3/8 x 1/4 strips 18-9/16 in. long; six pieces 1/8 x 3 sheet 4-3/4 in. long; bulkheads A1, A2, A3, A4, box sides and rear deck.

Facing the long side of the box outline, pin the first 3/8 x 1/4 strip inside the lower line, allowing strip to protrude 1/16 over the line at your right. This allows strip to be beveled later to receive the transom. Cement first box side to strip and add 1/8 x 3 x 4-3/4 sheets to form box bottom. Cement bulkheads A1, A2 and A3 to bottom and first box side in proper position and add second box side, 3/8 x 1/4 strip, bulkhead A4 and rear deck in that order. Be sure to use plenty of pins. If the structure looks like an angry chook-chook, you have enough pins and the box can be handled safely even though the cement has not thoroughly dried.

Trace and cut out side bulkheads B1 through B12 and side decks. Note that B12 is cut from 1/4 stock while the rest are 1/8. Mark off side bulkhead positions and cement B5 through B12 in place. Add side decks and set aside to dry. Note side decks are notched to fit around radio compartment.

Trace and cut out top and bottom decks, bow piece, keel, stuffing box supports and bottom bulkheads C1 through C10. Note that C4 and C10 are 1/4 stock and the rest 1/8. Keel is cut through to form passage for the stuffing box. Remove box from board and turn upside down, supporting front and rear so that upper portion of the radio compartment clears the work board. Cement top decks and bow piece in proper position, add keel, side bulkheads B1 through B4, bottom decks and all bottom bulkheads, again using plenty of pins. When cementing keel into position, place stuffing box tube between keel sections to assure a snug fit. (*Continued on page* 41)

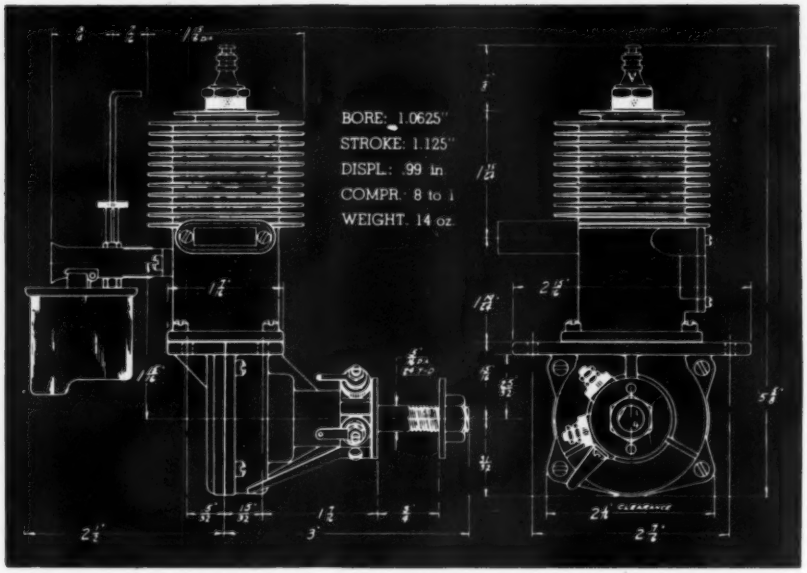
Scale trains or boats, scale speed is important. No 1,000 mph wonder, the Shoreboat, with gaily striped canopy, makes worthy project for beginner, expert.



FULL SIZE PLANS AVAILABLE. SEE PAGE 40.

ENGINE REVIEW

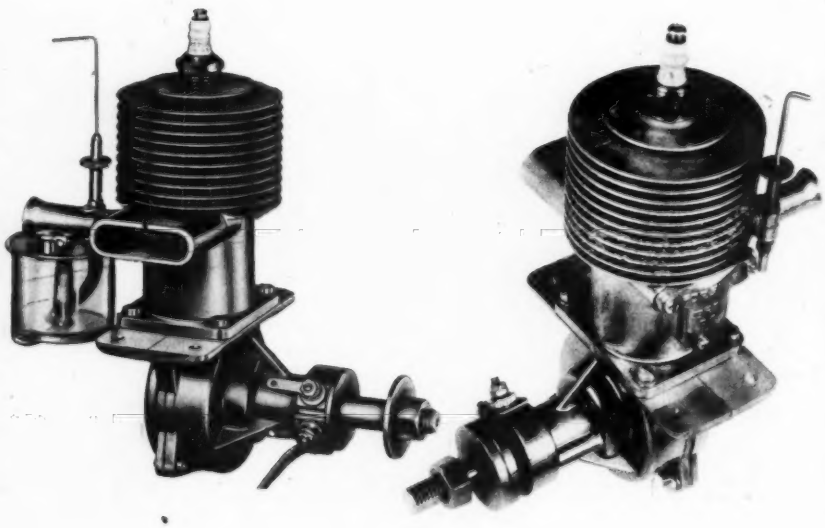
In response to RC'ers' demand, Forster revives wonderful two-speed, spark ignition .99, a real thrust maker, that's for sure!



-- Easy starting, precise power control, good cooling distinguish the .99.

by E. C. MARTIN

▶ The most potent reminder of old times for veteran modelers must surely be the noise and smell of a spark ignition engine, and it is with a feeling of nostalgia that we reintroduce that grand old warhorse, the Forster .99. Henry Ford was turning out the Model A when the Forster .99 made its debut and we can think of no better parallel in explanation of the unique qualities, among present day engines, than to call it the Model A of modeldom. It is not by any means the team of rampaging horses that screams out of a racing .60, and it falls far short of the urge produced by ten busy little .099 Diesels, but it has in great abundance those qualities we have almost forgotten—life almost eternal, trigger starting and reliability, hot or cold, rain or shine, and on plain ordinary gas and engine oil. Above all it is completely controllable from a lazy idle to a solid dignified roar, and it displaces air in quantities that will get 12 lb. of tissue and timber off the ground with remarkable ease. In addition to this it runs clean. With reasonable care there is no need to get a trace of oil on the finish, or even on your hands. You can go flying in your dress suit.



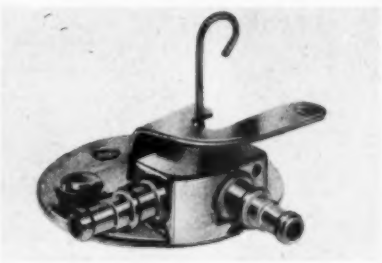
This Model A parallel goes just as aptly with the construction details. Obviously the cylinder is enormous with 1-1/16 in. bore and 1-1/8 in. stroke, but the crankshaft at 3/8 in. diameter would be just right for a hot .15, and when one dwells on the fact that this shaft has a 1/4 in. hole through it, the conclusion must be reached that we are dealing with a very different machine from the modern model engine. This brings us to the differences between spark ignition and the other types and, more particularly, the differences as they affect the Forster .99, for it would be unwise to run this engine consistently by glow plug.

If piston type heat engines were classified in terms of shock loading on the piston, rod and crank, steam engines would come at the bottom of the list and Diesels at the top, with spark ignition gasoline engines somewhere in the middle and glow plug between spark and Diesel. A steam engine sustains a steady push of almost constant pressure throughout the stroke of its piston. A Diesel produces a sudden concentrated blow somewhere near the top of the stroke, and a glow engine a similar shock, but of less violence and longer duration. The spark ignition engine of moderate compression ratio, like the Forster, burns its charge slowly, beginning some 45° before TDC, rising to maximum pressure at TDC, and continuing throughout the majority of the stroke, exhausting at moderate pressure. In other words the thrust on the piston is spread over a large proportion of the crankshaft revolution, and the maximum pressure, transferred to the crank when it is at TDC and taking all stress in bend and shear, is considerably less than in the other (*Continued on page* 45)

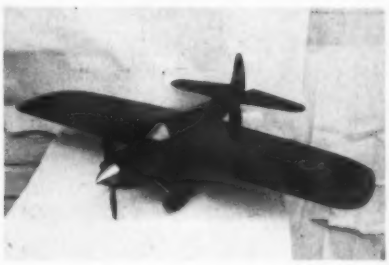
TRADE SHOW

MONTHLY REVIEW OF NEW PRODUCTS, OTHER INTERESTING ITEMS WORTH ATTENTION

▸ *Cessna 180:* Sterling Models, Philadelphia, Pa., scale kit for RC takes Half-A and Class A engines. Ruggedly built, with a wing span of 45 in. Can be flown sport free flight or as a U-control "goat." Hardware includes formed metal cowl, stamped spring steel landing gear. Length, 30 in. Price, $5.95.

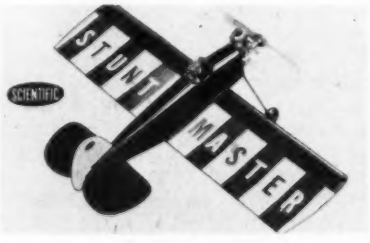


▸ *Fuel Shut-Off:* Stop-It, new shut-off by Kading Specialty Co., P.O. Box 484, Compton, Calif., gives instant action on plane, boat or car. Double action valve allows no fuel or air leakage, open or closed. Internal or external mounting, can reset in one second. Can solder to fuel line, tank for mount. $1.25.



▸ *Continental:* DMECO's (deBolt Engineering Co., Williamsville, N. Y.) new stunt model incorporates team racer good looks in high performance aerobatic U-control model. For the Fox and K & B .19's, .23's, .25's and .29's, it is fully prefabricated. Wing span is 40 in. Retail price $6.95. Wheel pants yet!

▸ *Stunt Master:* Designed by Walter Musciano, this small engine stunt model has wingspan of 18 in. Manufactured by Scientific Model Airplane Co., 113 Monroe St., Newark

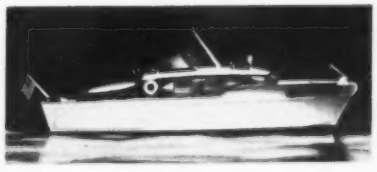


5, N. J., it sells for $1.95. Has carved balsa fuselage, die-cut balsa tail assembly and air foiled balsa wing. Many-colored decals make gay appearance. For such engines as Cub .049A, Space Bug, McCoy. Dummy pilot.

▸ *Plastikit Speedboat:* 98¢ outboard racing boat by Monogram Models, Inc., 3421 W. 48th Place, Chicago 32, Ill., features realistic and authentic pilot, created by a well known

sculptor. Model is patterned after 10 hp Mercury outboard Class B boat. This boat kit is the third in firm's all-plastic Plastikit series. The racing helmet and inflated life jacket make colorful item. Nice on mantle.

▸ *Chris Craft:* The 32 in. over-all length of this Chris Craft Cruiser by Berkeley Model Supplies, West Hempstead, N. Y., makes it good project for marine radio control fans.

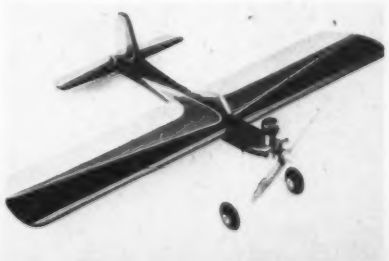


Powered by either a .29 gas engine or two miniature electric motors. Has formed plastic cabin, mahogany overlay. Cast deck fittings, authentic decals, die-cut balsa, mahogany, celluloid, etc. List is $14.95. Like them big?

▸ *Focke Wulf 190:* Offered by Wilshire Model Center, 1326 Wilshire Blvd., Santa Monica, Calif., U-control kit of German WW II fighter lists at $6.95. Engines from .15 to .29. Contains glue and dope as well as hardware. All parts, like prefabricated edges, wrapped individually in cellophane.

▸ *Super Sabre:* Powered by Jetex #35 Atom jet engine, model of Air Force fighter has die-cut balsa parts. Kit includes Air Force decals and cement. The manufacturer claims "any 10-year-old can assemble the kit in 15 minutes." American Telasco, Ltd., Huntington, N. Y. With engine, fuel charges $1.95.

▸ *Sky Raider:* Combination stunt and combat ship designed for use with Mono-Line control unit. Span is 40 in., power any Class A or B, or small C engine. On a .35, ship flies on 70 to 150 feet of line. Kit is completely prefab. $3.95. Slack wire will control. Victor Stanzel & Co., Schulenburg, Texas.

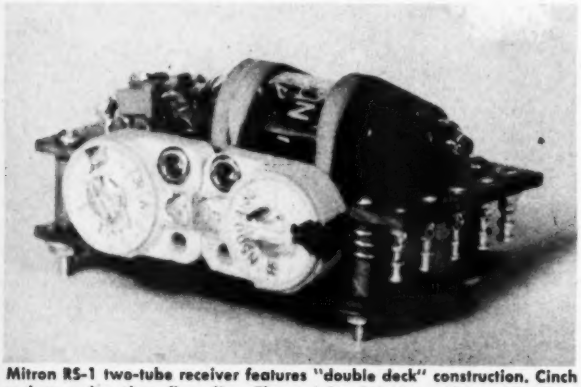


First place winner Staten Island contest, Joe Ferrara, had Bootstraps, Cub .14 Walker tank, Control Master radio, Broadfield field box handy.

Radio Control News

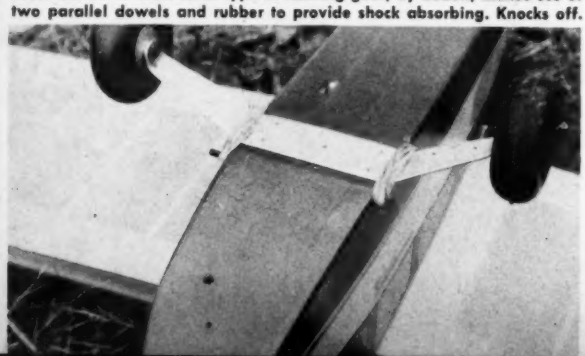
By E. J. LORENZ

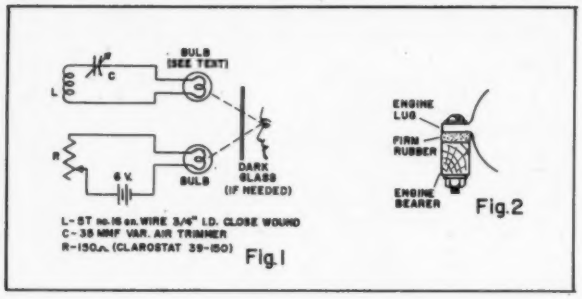
Technical topics, club news, new items. Individuals and clubs are invited to send in their ideas.



Mitron RS-1 two-tube receiver features "double deck" construction. Cinch sockets rather than flea clips. The weight: 2-1/4 oz. The usual tubes.

Modification to team racer type of landing gear, by deBolt, makes use of two parallel dowels and rubber to provide shock absorbing. Knocks off.





▸ We'd like to explain the delay in publishing our new two-tuber. The RK-61 tube is still undergoing final tests and, rather than publish a circuit using a component or part that has incomplete data on it, we are holding up publication until all tests are complete. Raytheon announced the production of a long life tube, but reports have come in that, with the increase in tube life, there was a decrease in sensitivity. This condition has seldom if ever occurred when using the RK-61 in a two-tuber circuit. However, the tube is being improved and we still hope to have the receiver in print in time for spring or early summer flying.

Before we get into the real meat of the subject, Figs. 1 and 2 must be explained. Fig. 1 is a method to check the output power of a transmitter. Used by the writer for about eight years, it has proved to be accurate enough for all practical purposes. However, it is used only to check the output of the tank circuit, which is absorbed by L and C, and does not mean that the radiated power from your antenna will be the same. This will depend on the type of antenna used and method of coupling.

Basically, we have two flashlight bulbs, both of the same type, connected as shown. The one with the coil and capacitor is brought near the tank coil to be checked, and C is rotated until the bulb is at maximum brilliance. The other unit has the rheostat turned until the brilliance of this bulb is equal to the first one. At this point, the voltage is read and the wattage is taken from the charts in the text, making sure the proper bulb is used in each case. A dark or smoked piece of glass should be used to view the two bulbs when the brilliance becomes too great to detect small differences between the two. The two set-ups should be prepared in a small box, with leads flexible enough for convenience. Use an air trimmer at C. Fig. 2 comes from Ron Wilson of Manchester, England and is his method of minimizing engine vigration. The rubber should be firm but not too hard and the bolts should be tightened only enough to hold the engine properly in place.

The following is a clarification of a few points made in a previous column regarding the FCC rules and regulations. These were brought to our attention by E. L. Rockwood of multi-channel reed receiver fame. First of all, the frequency of 27.255 mc is a "spot" frequency in the 27 mc Citizens Radio Service band, and *all* operation must take place on this frequency, plus or minus .04 per cent. It was the intention, when first explaining this, to discourage anyone from attempting to operate more than one RF channel in the 27 mc band. RC work as we know it *must* stick to this one spot frequency and the frequency *may not* be used for two-way communication purposes. We hope this clears up any misunderstandings which may exist. Another item brought out by Mr. Rockwood is that everyone should send in his FCC transmitter registration blanks. At the present time, the FCC has only about 6,000 applications on file, a figure that in no way compares with the actual number of fliers. In view of this relatively small number of applications, they do not feel that another free band is needed. Send them in, fellas, and help promote RC work. You have (*Continued on page* 50)

FOR .19 TO .29 ENGINES

dmeco's *Continental*
FULL STUNT MODEL

$6.95 *Now*

A SEMI-SCALE AIR RACER
WITH TOP STUNT PERFORMANCE
A FINE SUPER DELUXE KIT,
PLUS DMECO'S FAMOUS QUALITY!

10 YEARS OF PROGRESS BUILT INTO ONE DESIGN!

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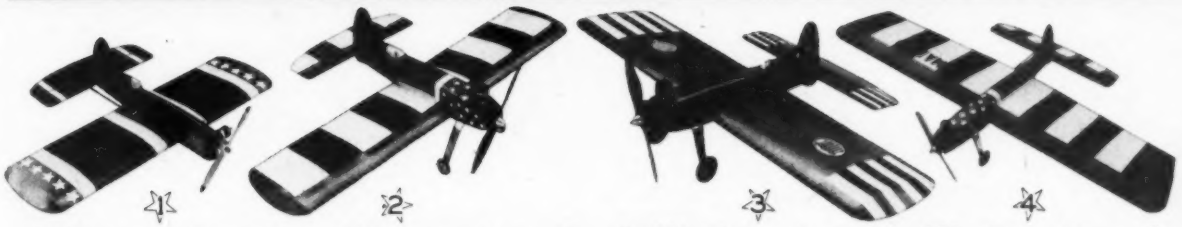

All American Jr	*All American Jr*	*"All American"*	*All American Sr*
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dmeco's NEW REALISTIC RADIO CONTROL MODEL!

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THE "CLIPPER"

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THE "KITTEN" R/C

. . . for those who want spectacular performance

accessories designed for R/C

Fly safer and easier with

MULTI-SERVOS

MOTOR DRIVEN R/C ACTUATORS

POWERFUL-DEPENDABLE!

FOR BEGINNER OR EXPERT!

Using your simple single channel radio *without* changes you can have your choice of single or multiple controls, selective to your command. Install one in your model now and use less batteries at a lighter weight! There are no linkage or rubber band problems, those worries are gone forever with ½ lb. torque, motor driven "Multi-Servos"

4 GREAT MODELS, ONE FOR EVERY R/C NEED!

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Two positions with an automatic neutral, for single control operation.

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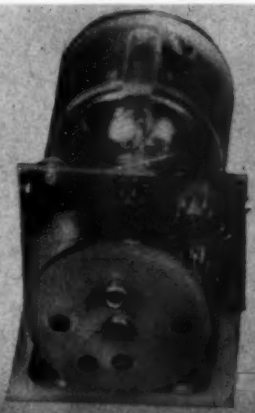

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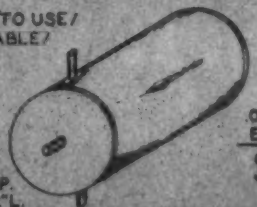
FOR SMOOTH ENGINE RUNS USE THE

Positive Flow FUEL TANK

SIMPLE TO USE! DEPENDABLE!



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1 1/2" D. X 2" L.

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FEEDS FUEL FROM ANY POSITION

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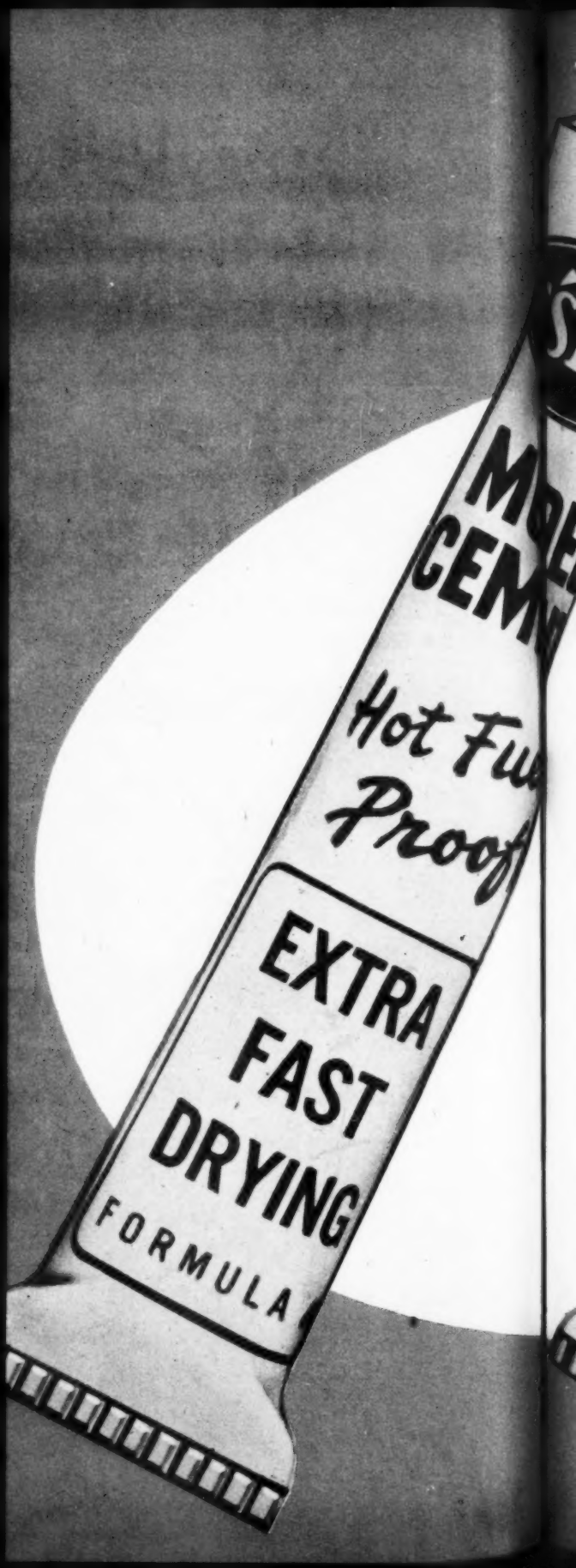

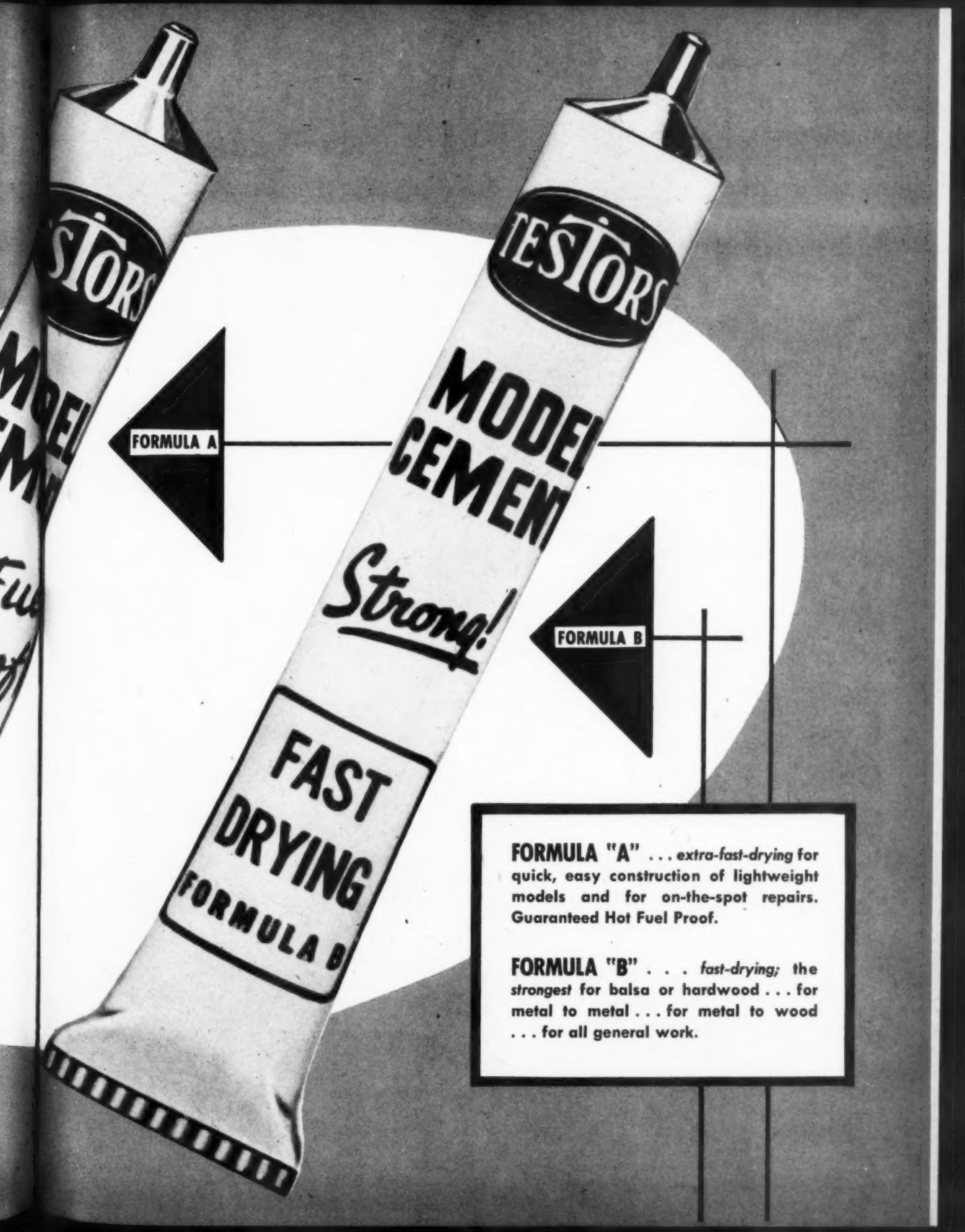
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FAST DRYING
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FORMULA "A" . . . extra-fast-drying for quick, easy construction of lightweight models and for on-the-spot repairs. Guaranteed Hot Fuel Proof.
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P. G. F. CHINN

FOREIGN NOTES

A monthly world-wide round-up of technical developments, designs, significant industrial products.

by P. G. F. CHINN

Interesting Japanese Models

Some highly impressive controlline scale models continue to appear in Japan. From the Ogawa Model Manufacturing Co. of Osaka, manufacturers of the well-known O.S. line of motors, we have received details of some models built by the company for experimental and demonstration purposes. Among them is a remarkably finely finished Bell X-5 powered by an O.S. Type 2 pulse jet unit. Of much smaller proportions and evidently aimed at achieving high speeds is a semi-scale F.84 Thunderjet of all-metal construction, also powered by an O.S. Type 2 jet. Something rather different is a big, 9-lb., 1/8 scale Fieseler Storch powered by an O.S. Super 64. The familiar Superfortress rounds off the collection, this time a model of a B.50 powered by four O.S.-Max .35 cu. in. glow plug motors developing a total of approximately 2 hp.

New Diesel Contender in Half-A Class

Advance information on the Allbon Half-A Diesel was given in December FN. This new product from Davies-Charlton Ltd. of England, one of the biggest model engine manufacturers outside the U. S., is now being imported to sell at a competitive price. Known as the Merlin, the new job has a .375 in. bore with .420 in. stroke, giving a displacement of .046 cu. in., and weighs 1.8 oz. Circumferential ports and shaft valve are used. Although main casting is not tumbled to produce pleasing polished finish popular with U. S. manufacturers, diecasting is good, with smooth surface.

Long life is claimed for the Davies-Charlton built motors and particular attention is paid to crankshaft main bearings. The Merlin has a chrome-nickel steel shaft and a connecting rod made of one of a series of special high duty aluminum alloys developed by Rolls-Royce. Power output is slightly better than .06 bhp at 12,500-13,000 rpm.

ECC 951B Receiver

The Electronic Control Components 951B receiver (imported by American Telasco) is basically identical with the 951A, with the exception that all connections are via a simple six-pin socket which fits onto the receiver. The six are connected as follows: No. 1 to h.t. positive via two-pin socket for meter; No. 2 to relay outer contact; No. 3 common ground for armature, l.t. and h.t. negatives; No. 4 to antenna; No. 5 to relay inner contact; No. 6 to l.t. positive.

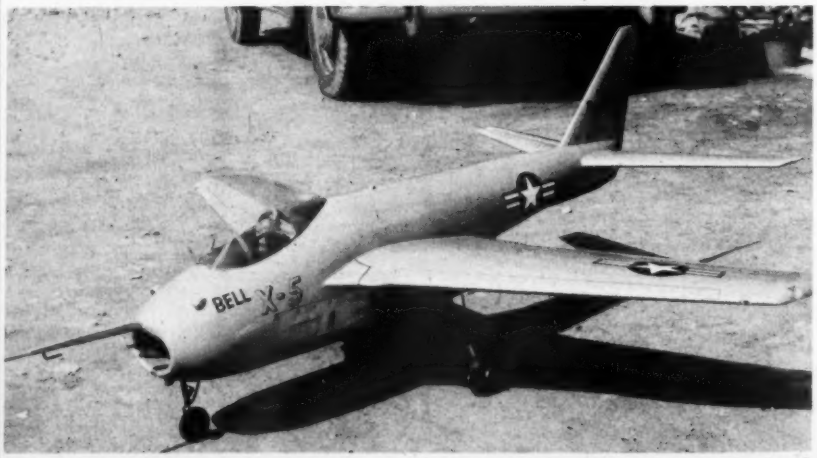
The 951B incorporates the new P.100 polarized relay. It is adjusted to fall in at 2.2 ma and to fall out at 1.8 ma, when using 67-1/2 volts on receiver. There should be no necessity for making any adjustments to the relay. Mounting on foam rubber is recommended.

Coil formers are now molded integral with the receiver chassis to eliminate the tendency to break off in a crash landing, a fault which was rather common with the 951A sets.

The complete receiver, with tube, relay and molded case, weighs 3.1 oz.

Australian News

From New South Wales comes the first issue of the newly revised Monthly Bulletin of the Model Aeronautical Assn. of New South Wales. The Bulletin contains brief articles by well-known Australian modelers, plans, trade reviews and a motor review. Just now, Australian model builders are not too well off for model literature in their own country and have to rely mainly on American and British model publications which, naturally, means that, by the time these magazines reach them (up to two months after publication), much of the news contained in them is out of date. Australia's one model magazine had an uphill struggle and gradually appeared less and less frequently and, as far as we know, the only regularly published model material now appearing on a national basis is Jim Fullarton's short model section in the Australian monthly magazine "Aircraft." Bulletins issued by the various state model organizations, therefore, can do much



Outstanding Japanese scale jet, Bell X-5, powered by O. S. jet motor. Scale jet is highly developed activity among Japanese modelers. Bell X-5 can alter the angle of sweepback for experiments.

Japanese Fieseler Storch—German liaison plane —scale 9 pounds. Powered by a .64 O. S. motor.

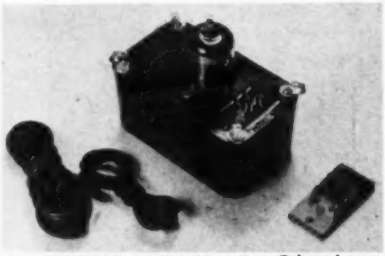
to fill in the gaps and editor Jack Dunkerton is to be congratulated on all the hard work he has put into producing the MAANSW Bulletin.

The Australian Nationals are pending, as we write these notes. This year they are being held at the Royal Australian Air Force Base at Mallala, which is about 45 miles from Adelaide in South Australia. As usual, there is a full program of over 20 events, spread over seven days.

Marine Motors Catching On

Many model aircraft engine manufacturers in Europe are now marketing marine versions of their motors. Ranging from .03 cu. in. to .29 cu. in., these include Allbon, Elfin and ED in England and the well known Mills is also available as a special marine conversion by Ripmax, the London model specialists. On the Continent, the Dutch Typhoon concern are turning out a nicely made boat version of their .15 cu. in. Diesel and Graupner in Germany is marketing a special Taifun .15 motor complete with metal base, propshaft and clutch assembly.

All these motors are watercooled Diesels. Many Diesels use a screw-on finned cylinder barrel and it is an easy matter to replace this with a simple water jacket. Water cooling has particular advantages with a Diesel since it keeps the cylinder at a cool, even temperature and thus eliminates the variations in ignition timing caused by the motor heating up.



New ECC 951B receiver (American Telasco) uses polarized relay and six-pin receiver connector.

C/L Aids Swedish Fighter Design

British "Model Aircraft" magazine recently carried an article describing the use of special controlline models for research purposes by the Royal Swedish Air Force and Swedish SAAB Aircraft Co. Models were all metal and to a scale of 1/7 full size, power being supplied by a pulse jet motor of 5-1/2 lb. thrust. The models are reported to have helped to establish the practicability of the double-delta configuration now adopted for the SAAB *Draken* jet fighter.

The Lowdown On Imported Motors

A Basutoland tribesman would probably rate a Model T Ford a mighty fine conveyance as he doesn't get the chance to drive a Lincoln Cosmopolitan and is blissfully ignorant of the standards of the American motorist who wants hydramatic drive, 200-hp, power steering and electric windows. Your reporter, on the other hand, has driven a Lincoln Cosmopolitan.

In case you are wondering what this has to do with model (*Continued on page 34*)


By Sterling—In PLASTIC!
Chris★Craft 42′ EXPRESS CRUISER
Never before, anywhere, an authentic scale model PLASTIC boat kit like this! 73 jewel-like pieces, molded in 3 authentic colors, are easily assembled, even by beginners! Kit contains a wealth of authentic detail, from venetian blinds down to specially designed shelf-mounting base. And now . . . another first! . . . Complete with specially engineered parts for power operation—battery box, extra-power rudder and propeller, electric motor mount, shaft and stuffing box, etc. Simple, easy-to-read instruction sheet includes visual directions for assembly and power operation. Ask your dealer!
*All the authentic beauty of the full-sized vessel captured ON THE SHELF!
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BEAM 4⅛"
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*Electric motor not included.
Ready for quick, easy assembly!
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Kit B-15M
$24.95

Deluxe 62-pc. Scale Marine Fitting Set B-15F $8.95

MAMBO RC TRAINER

A perfect trainer for the beginner! Precise stunting and controlled flying for the expert!

• Incorporates the newest aerodynamic principles! • Over 2½ years in development!

Here's the newest RC trainer . . . designed specifically for radio control! Flight tested to insure stability, wind penetration and maneuverability even in high winds! Simple rugged construction insures fast assembly and long life. Highly detailed plans cover every step of construction. Complete with radio installation details and flying instructions!

Kit contains die-cut balsa fuselage sides, wing and stabilizer ribs, rudder, fuselage bulkheads, etc. Structural die-cut plywood bulkheads, wing gussets, etc., to insure maximum strength. Formed landing gear, decals, silkspan, detailed plans, etc.

Kit FS-3, Span 48"
Length 32½"

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For engines from .09 to .19

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Yes, I'd like to have a copy of the new Sterling catalog! Enclosed is 10c in coin to cover handling and mailing.

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Foreign Notes

(*Continued from page* 31)

airplane engines, we should mention that we have also operated McCoys, Doolings, Torpedos, Atwoods, Andersons, Foxes, Cyclones, Ardens, Cubs, Forsters and the like, as well as Amco, Allbon, BWM, Elfin, Eta, ED, Frog, Mills, Metro, Nordec, O.S., Enya, Fuji, Supertigre, Typhoon, Taifun, Webra, Waf, Wilo and many even more unfamiliar makes, all of which comes in very handy when sorting the wheat from the chaff.

Now, we have been talking about engines of various nations in MAN for the past three years or more. By European standards, or by international standards in general, some of these motors have been good. But with so many overseas engines now being imported into the U.S.A. (there are about 16 different makes at the moment), it becomes increasingly important to evaluate these motors in regard to the U.S. market only. The subject is too big to be dealt with in detail here, but if you are contemplating the purchase of a foreign motor and have not had any previous experience with one, it is worth bearing a few facts in mind: 1) American model motors are, in general, the best in the world; 2) Generally, they are the best value too; 3) Without mentioning names, there are, perhaps, a half dozen foreign makes worthy of the American modeler's attention; 4) There is no foreign glow plug engine better than its American equivalent; 5) Diesels are only worth considering in .15 cu. in. and smaller sizes; 6) Above that size, Diesels are rougher and are not as powerful as a good equivalent glow-plugger; 7) In the Half-A class, the Diesel is more powerful, although heavier, than the average glow plug job.

World's Record List

The Russians are still taking the FAI record list mighty seriously, despite apparent reluctance to compete with Western modelers in FAI-recognized World Championship events. The current FAI record list shows the USSR as holding ten world and International Class records. Hungary comes up in second place with seven records, while Czechoslovakia adds one more to the Iron Curtain bag. Heading the decadent West is the U.S.A. with three international records, followed by Great Britain, New Zealand, Germany and Italy with one record each. END

Perdido

(*Continued from page* 18)

or to advocate haphazard building. In fact, as far as building goes, I intend just the opposite: I hold smooth, sound building to be of more utility than the sections themselves. Nor is my heresy complete with regard to differences between sections. Of course there is a difference and certain airfoil patterns are superior; I simply don't like to see the differences exaggerated. I'm convinced that the effects of structural deviations from the intended airfoil, placement of spars and the resulting turbulator effect do much more to change airflow than most builders realize. As I said, the curve in the Perdido wing is rather 6409-ish; furthermore, it doesn't differ performance-wise from a bona fide 6409, as far as I can tell. Thus is my argument reinforced. My position can be summarized simply: the fiction lies in the sharp distinctions between airfoils that designers are wont to make.

I don't like to say much about building—partly because the plans say enough, partly because I think the builder should make his own interpretations, but mostly because I think comment on theory and flying is both more interesting and more useful. I would like to say that the structure is rugged and fairly light, but in the fuselage especially hard balsa is important—particularly in the front where the weight is good. This is apparent in view of just how little structure is used in the fuselage.

After the fuselage sides are joined, build up the front section of the wing mount in any sequence desired. Wing and tail are simple, but do them carefully. I like a silked structure; it comes in handy when the ship whomps down in the middle of a sagebrush. If you lack sagebrush, make your own applications.

The Perdido is rather heavily adjusted. I like to avoid this whenever possible, but with all the flying that I've done with the Perdido, these adjustments have come to seem quite natural and almost necessary. I use 2° left thrust, 1/4 in. wash-in on the left inboard wing panel, 1/16 in. tilt in the stab table for the left glide, and left on the rudder tab as necessary to maintain trim. I would suggest that the 1/4 in. wash-in with the left climb pattern be used. This in turn makes a left glide mandatory, since gliding with wash-in outside the glide circle is akin to suicide. This is an old story, but be careful on the first power flights. With all the adjustment indicated, the ship should fly almost horizontally under low power with a little left turn, but this left turn is impossible to predict; it could be altered by a hundred things in the way a particular ship is built. Since the ship will stay quite near the ground under low power, any excessive turn will fly it into the dirt in a big hurry; so again, caution. Five or six seconds of power with the prop backward to start will give enough indication of where the ship is going. From here work carefully into the left-left pattern, aiming at one power turn in 20 seconds of full power. Make the ship glide left tightly.

I don't want to leave out our VTO approach to ROG here in Salt Lake City, where I live. The Perdido is beautifully tailored to such flying with its close incidences and resulting flat flying characteristics. I fly it off at about 70° and it holds that angle off the ground and into the climb pattern without any of the "rounding off" that slower ships exhibit with a steep VTO. Set it on its tail just once for a flight—it's infectious! I left the landing gear off the plan because of my uncertainty, at the time of design, about what AMA would do with the 1955-56 rules. If VTO becomes illegal, use any conventional take-off gear; if not, use a simple retracting VTO strut on the back of the fuselage.

The trouble with hot ships lies in the effect on the nervous system of the flier and in the need for constant minor trimming. I think you'll find the Perdido a happy surprise here. Once trimmed, it shows remarkable tenure of adjustment and you can trust it without using kid glove tactics on low power at the beginning of every flying session.

The ship is covered with red silk, doped on the wing and stab with Fuller's nitrate and on the fuselage with Fuller's butyrate. There is no need for plasticizing dope for the fuselage since nitrate doesn't pull up too tightly on the wing and stab. END

Gadfly

(*Continued from page* 15)

Form the landing gear legs from 1/32 in. diameter wire. The front brace is notched into the nose block and the lower ends are, for the last 5/16 in., bent parallel to the main legs. Bind with thread at points of contact and cement securely. A 1/32 sheet fairing is cemented to the legs as indicated in the plans. A spreader bar may be added if desired.

Wheels are made from cross-grained laminations of medium hard 1/16 sheet. Use 1/16 in. diameter aluminum tubing for bushings with 1/4 in. copper washers as collars. The wheels are held on by drops of cement on the axle ends.

Make the stabilizer and rudder from 1/16 square. Curved parts for the rudder are cut from 1/16 sheet.

Build the wing in right and left panels. No separate center section is made. Shape and sand the leading and trailing edges before joining the wing halves. Block the wing panels up over the wing plan to give the 1-5/8 in. dihedral. Put in the small leading and trailing edge pieces and the spar pieces to form the center section and complete the wing structure.

The propeller shown on the model was finished from a 7 in. machine-cut balsa blank. Carve and sand the blades to an airfoil shape and drill the hub to receive a bushing of 1/16 aluminum tubing. Use 1/4 copper washers as collars over the ends of the tubing to strengthen the hub and act as a bearing surface. Give the prop a coat of sanding sealer and sand lightly. Balance the prop carefully before and after doping.

A Paulowina prop may also be used. It is easier to install and is almost unbreakable.

Some type of small free-wheeling device will improve the glide. The aluminum tube-bent pin unit works very well.

Cut a piece of 1/16 tubing and insert a piece of straight pin. Make bends at the ends at right angles to each other. The top part points left against the prop when the lower part engages with the arm on the winding hook.

Bind the tube unit in place and cement securely. Recheck the prop for balance. Bend the winding hook end of the prop shaft and slide on the prop, two 1/8 brass washers and the thrust button. Form the motor hook last. A piece of rubber tubing on the hook will protect the motor against cuts.

Before beginning to cover the various surfaces, sand them lightly and give the structure a coat of clear dope to seal the wood. If possible, cover the model with Japanese tissue, using dope as adhesive.

Trace the cockpit cowling on bond paper. Trim for proper fit and cement in place. Cut strips of tissue to cover the fuselage between the stringers for a wrinkle free job. Water spray to shrink the tissue and brush on one coat of thinned clear dope.

Cover the tail surfaces on both sides. These light surfaces may be sprayed and doped if they are pinned down to a drawing board during the process. Be careful the dope does not touch the board.

The wing is covered in sections: first the panels, top and bottom, and then the center section. Dope the tissue to the wing outlines only. Pin and block the wing during the shrinking and doping to minimize warps.

Cement the tail surfaces on the fuselage and check the alinement carefully. Add the 1/16 sheet tail skid. The wing is held in place with a rubber band.

Details may be added as desired. Identification letters and control surface outlines are cut from Trimfilm or black tissue.

The dummy engine parts are cut from medium soft balsa. Wrap the cylinders with spaced loops of No. 8 black thread. Give the completed engine a coat of sealer and finish with black dope. Although it is by no means a scale engine, it gives a realistic impression of the ABC Scorpion engine with which the Gadfly was fitted.

Instruments are small circles of white paper cemented on the black panel. Cut the conical windscreen from light celluloid and outline in black tissue.

Add silver doped paper discs to the wheels for a final touch of realism.

Make up a four strand motor of 1/8 flat T-56 rubber and lubricate thoroughly before installing. Test for a long flat glide. If the model is slightly nose heavy, increase the angle of incidence slightly. With a satisfactory glide established, give it a bit of right rudder for a slight turn.

For a right climb under power put in a little right thrust by cementing a small sliver of balsa under the left side of nose button. The proper climb-right glide adjustment makes for a very smooth power-to-glide transition.

With its simple construction and easy adjustment the Gadfly will give many hours of flying pleasure. It is slow and stable and will take off and land beautifully just like the original Glenny & Henderson light plane.

Bill of Materials

(All measurements in inches)

Five pieces 1/16 x 1/16 x 36 medium hard balsa: fuselage, tail surfaces, wing spar.
One piece 3/32 x 3/32 x 18 medium hard balsa: wing leading edge.
One piece 1/16 x 3/16 x 18 medium hard balsa: wing trailing.
One piece 1/32 flat balsa: wing ribs, fuselage formers.
One piece 1/16 flat balsa: wing tip ribs, wing root ribs, fuselage formers, wheels, motor pin receivers.
One piece 1/2 x 1-1/2 x 1-3/4 medium soft balsa: nose block.
Scrap balsa, medium soft: dummy engine.
One 7 in. propeller, balsa or Paulowina.
One nose button, hardwood, balsa, or plastic.
One piece 1/32 in. diameter wire: landing gear, prop hook.
One piece 1/16 in. diameter aluminum tubing: wheel bushings, free-wheeling unit, balsa prop bushing.
One piece 3/32 in. diameter dowel: motor pin.
Six 1/4 in. copper washers: wheels, balsa prop hub.
Two 1/8 in. brass washers: prop bearing.
One sheet Japanese tissue or light-weight Silkspan.
One tube cement.
One bottle clear dope.
One piece 1/8 flat T-56 rubber 42 in. long.
One bottle rubber lubricant. END

Contest Calendar

MARCH

6—*El Paso, Tex.:* El Paso Miniature Motors Flying Diablos Record Trials for FFG, OR, TLG and OHLG. Similar Record Trials also on June 5, Sept. 10, Dec. 4. Fred Lind, C.D., 1610 E. Yardell, El Paso, Tex. Pending.

13—*Ft. Worth, Tex.:* Cowtown Sahibs' Record Trials for all outdoor classes. Similar Record Trials also on Apr. 10, May 8, June 12, July 10, Aug. 14, Sept. 11, Oct. 9, Nov. 13, Dec. 11. Ralph Tenny, C.D., 2409 Spiller, Ft. Worth, Tex.

13—*Philadelphia, Pa.:* Class A Bucks County Federation Indoor Meet for IHLG, IR. Similar meet also scheduled for Mar. 27. W. M. Dunwody, C.D., 3335 Ashville St., Philadelphia 36, Pa. Entry is restricted to members of BCFMAC. Pending.

13—*Bakersfield, Calif.:* Bakersfield Record Trials for FFG. Francis Stewart, C.D., 900 21st St., Bakersfield, Calif.

(*Continued on page* 38)

APRIL

17—*Inglewood, Calif.:* Class AA Skywolves Team Race. Similar team races also on June 12, July 10, Sept. 11, Nov. 13. Don C. Crystal, C.D., 805 E. Palmer Ave., Compton, Calif. Pending.

MAY

21—*New York, N. Y.:* Class AAA 10th Annual Mirror Model Flying Fair for CL, combat, TR, CLS, NC, FFG, PL, RC, CLFS, beauty, CC, helicopter. Ted Clodius, C. D., New York Mirror, 235 E. 45th St., New York 17, N. Y.

21-22—*Moffett Field, Calif.:* Class AAA 1955 California Model Airplane Championships for IR, IHLG, FFG, OR, RC, CL, CLS, CLFS, TR. H. S. Robbers, Sr., C.D., 5610 E. 17th St., Oakland 21, Calif.

29—*Bristol, Pa.:* Class AA 5th Annual Flying Circus for NC, CLS, combat, TR, CLFS, OHLG. Albert E. Abrams, Jr., C.D., 1031 Pond St., Bristol, Pa. Pending.

30—*Galesburg, Ill.:* Class AA Memorial Day U-Control Contest for TR, CLFS, CL, combat. Kenneth W. Freese, C.D., 90 Olive St., Galesburg, Ill. Pending.

JUNE

4-5—*Goodland, Kan.:* Class AA Northwest Kansas Gashoppers' Meet for FFG, CLFS, CLS, combat, RC, CL. Kenneth Armstrong, C.D., Goodland, Kan. Pending.

5—*Hartford, Conn.:* Class AA Greater Hartford Spring Team Race. Richard Matava, C.D., 358 Prospect Ave., Hartford, Conn.

5—*Farmingdale, N. Y.:* Class AA 2nd Annual Long Island Industrial Championships for CL, CLS, combat, NC, beauty. Arthur F. Wardell, C.D., 2 Hunt Place, Bethpage, N. Y.

5—*Fall River, Mass.:* Controlline Contest. David P. Turner, C.D., 422 S. Main St., Fall River, Mass. Pending.

12—*Ft. Wayne, Ind.:* Mad Modelers' Meet. Walter A. Krull, C.D., 414 E. Washington Blvd., Ft. Wayne 2, Ind. Pending.

12—*Corning, N. Y.:* Class AA 2nd Annual Flying Sparks' RC Meet. W. E. Bliss, C.D., 47 Corning Blvd., Corning, N. Y. Pending.

12—*Easton, Pa.:* Class AA Model Airplane Doctors' Contest for FF, TL, rubber, PL; Speed AB, CD Jet, stunt, combat, RC; Junior to 18; Senior over 18. Russ Sottosanti, C.D., 1113 Keane St., Easton, Pa.

16-19—*Atlanta, Ga.:* Class AAA Greater Southeastern Model Airplane Contest. Lloyd Wason, C.D., 315 Church St., Decatur, Ga. Pending.

26—*Kansas City, Mo.:* Class AAA 3rd Annual Controlline Contest for CLS, combat, CL, CLFS, TR. P. W. Asjes, C. D., 5313 Ralson, Kansas City 29, Mo. Pending.

26—*Detroit, Mich.:* Michigan State Exchange Clubs' Annual Model Airplane Contest. Pending.

26—*Mankato, Minn.:* Class AAA Mankato Exchange Club Model Airplane Meet for FFG, CL, CLS, TLG, combat, CLFS, TR, RC. William B. Thomas, C.D., Box 713, Lake Crystal, Minn. Pending.

JULY

3—*Chicago, Ill.:* Class AA 3rd Annual Chicago Prop Nutz Flying Meet for FFG, OHLG, TLG, OR. Peter J. Sotich, C. D., 3851 W. 62nd Place, Chicago 29, Ill.

10—*Joliet, Ill.:* Exchange Club of Joliet Flying Circus. Glenn F. Stearman, C.D., 604 Abe St., Joliet, Ill. Pending.

17—*Hartford, Conn.:* Class AA Insurance City Team Racing Meet. Charles J. Gallagher, C.D., 47 Church St., East Hartford, Conn.

18-24—*Los Alamitos, Calif.:* Class AAAA National Championship Model Airplane Contest.

AUGUST

7—*DeKalb, Ill.:* Class AAA DeKalb Cloud Dusters' Flying Circus for FFG, OR, RC. Dutch Hess and Dale Hindenburg, C.D.'s, 137-1/2 E. Lincoln, DeKalb, Ill.

28—*Pennsylvania:* Class AAA Pennsylvania State Exchange Approved Meet. Pending

SEPTEMBER

5—*Far Hills, N. J.:* Class AA Bedminster Far Hills Lions Club Annual Controlline Meet. C. M. Vanderwaart, Box 151, Bedminster, N. J. Pending.

11—*Hartford, Conn.:* Class AA Greater Hartford Autumn Team Racing Meet. Robert H. Haines, C.D., 75 Evergreen Ave., Hartford, Conn.

KEY TO LISTING OF EVENTS: FFG—Free Flight Gas; CL—Controlline Speed; OR—Outdoor Rubber; TLG—Towline Glider; IR—Indoor Rubber; OHLG—Outdoor Hand-Launched Glider; IHLG—Indoor Hand-Launched Glider; CLS—Controlline Precision (Stunt); CLFS—Controlline Flying Scale; RC—Radio Control; TR—Team Racing; FFFS—Free Flight Flying Scale; PL—PAA-Load; CC—PAA Clipper Cargo; NC—Navy Carrier.

Contests designated "Pending" mean the application is before the proper authorities as we go to press; "Record Trials" mean no prizes, but a chance at cracking the records; "Class A" is a meet with restricted entry; "Class AA" is a meet with unrestricted entry; "Class AAA" is a state-wide or regional meet; "Class AAAA" is a national or international meet. END

Pen Pals

▸ International appeal of aeromodeling is reflected in world-wide requests for pen friends: N. Cairns, 66 Perth St., Belfast, North Ireland, 15, will exchange magazines; Ken McDonnell, 158 Darling St., Dubbo, N.S.W., Australia, 18, c/1 stunt, combat, TR, speed; Karl Gustaf Dahlqvist, Hunnebostrand, Sweden, all ages; H. W. Gilkes and R. Haywood, 50 Alder Rd., Longford, Coventry, Warwickshire, England, 23 and 22, combat, stunt; A. K. Clare, 147 Taylor St., Cambridge, North Island, New Zealand, 15, c/1 scale, sport, stunt, FF; and from the U.S.A., Kenneth Widon, 20458 Gallagher, Detroit 34, Mich., 12-15, PAA-Load, Half-A FF; Steve Oakley, 223 Glen St., Roseburg, Ore., boats and planes . . . Interested in selling or swapping modeling goods are Bernard Twardowski, 15 E. Union St., Nanticoke, Pa., who offers North American transmitter in "very good condition" . . . Clifford McMillan, 47 Hamilton Ave., Akron 4, Ohio, who has 65 varied motors; particularly wants Elf single .099A . . . O & R .23 will be swapped for BWM .15 or Webra Winner .15 by Roger Robertson, Box 816, Babbit, Nev. . . . Steven Starley, 1701 W. Third St., Brooklyn 23, N. Y., will sell Atwood water-cooled outboard and 21 in. sport fishing boat; wants deBolt 3PN and 3P servos . . . You can acquire Mohawk Chief, Anderson Spitfire and Spitzy all for Dooling .29 or similar engine. Write to John Thackrey, 10109 Exposition Blvd., Los Angeles 64, Calif. . . . Scale jet information, especially from Japan or England, will be welcomed by Allen Weast, 3524 El Sereno Ave., Los Angeles, Calif. . . . And another request for Wylam Book I: Kenneth A. McLean, 185 Lanark St., Winnipeg 9, Man., Canada . . . H. M. Kolstee, 36 Southworthstreet, West Springfield, Mass., will exchange 1/2 cc Allbon Dart for O & R .29 marine engine, or similar . . . Send news of your old Cleveland kits — Rearwin Speedster gas model, Curtiss Hell Diver, especially — to Vincent Bellipanni, 3030 Wallace Ave., Bronx 67, N. Y. . . . Offer of first five volumes of *Aircraft of the Fighting Powers* in exchange for any glow or ignition engines made by M. L. Beach, 3 Lebanon Court, Twickenham, Middlesex, England. END

Half Fast

(*Continued from page* 10)

second hole. Pushrod should be bent to approximate shape and fixed at the bellcrank; 1/2 oz. wing-tip weight is fixed solidly between 1/4 in. square spars. Planking on top of wing should be cut approximately and slot for pushrod cut. Pushrod is slipped through this slot as planking is cemented down. Length of slot may be adjusted later. Planking is put on top of ribs with no recess. This won't harm performance at all and makes assembly much simpler. Bottom is planked between No. 1 ribs only. Elevator is attached with cloth hinges spaced evenly along span. I use cotton aircraft rib tape 3/8 in. wide. It is available in various widths at airport supply houses. Install horn using a piece of plywood on bottom to back of screws. Make certain elevator is neutral when bellcrank is neutral, since it is essential to have exactly the same amount of up and down motion.

My original had double covering of Japanese tissue, cross-grained for strength and resistance to splitting. We fly in weeds, making this tough covering essential. One ship was silk-covered and, as expected, has proved very rugged. Dope used was two coats of 80-20 nitrate, plasticized, and one coat of fuelproofer.

The 1/32 in. wire tank hold-down is shoved up through the No. 1 ribs and the hooks are then bent. Drill holes for engine and mount engine and tank. We use a square tank, 2 x 1 x 3 in., with a single vent. However, one ship has flown with a commercial wedge tank with no trouble. Suit yourself. Don't forget the 1/4 x 3/8 in. tank fix. This helps keep the tank from sailing forward in the event of a crack-up. The rudder should be cemented well, as it is used as a handle in launching. Solder a washer on pushrod at elevator horn. We've also found that a piece of 1/4 in. O.D. tubing or a grommet is handy in the streamer mounting hole. It prevents the string from stripping out the rudder. After a checking over, she should be ready for flying.

A word about flying: be very certain the CG does not fall behind the indicated position. Launching is accomplished in this manner—the helper holds the rudder in his right hand and the leading edge in his left. The plane is tilted up about 10° and launched from a standing position with a gentle push forward. She accelerates rapidly, so be ready. Response to control movement is rapid and positive, although level flight is steady enough for "eyes off" flying. After a conventional plane, she'll seem sensitive, but after a little time, the ordinary ship seems sloppy.

If, after trying one, you want more, I suggest some time well spent in building a jig for assembly. This could be a club project. This, with tin templates and a jig saw, will enable you to turn out hot combat ships at a good clip.

Bill of Materials

(*Measurements in Inches*)

One—1/2 x 2 x 6 maple, gum, etc., crutch.
One—1/4 x 3 x 36 balsa (hard) No. 1 ribs and trailing edge.
One—1/8 x 3 x 36 balsa (hard) elevator, wing tips.
Three—1/16 x 3 x 36 balsa (C) ribs and planking.
One—1/4 x 3 x 36 balsa (medium) rudder.
One—1/2 x 1 x 36 balsa (soft) leading edges.
Two—1/4 sq. x 36 balsa (hard) spars.
Two—1/8 sq. x 36 balsa (hard) spars.
One—1/16 x 3 x 1 24S-T aluminum bellcrank support.
One—.040 x 1 x 2 24S-T aluminum control horn.
Three—No. 6 screws and nuts; 3/32 wire; 1/16 wire; 1/32 wire; 1/8 O.D. tubing for lead-outs; 3 in. Veco bellcrank and usual hardware.

END

Flash News

(*Continued from page 7*)

said, "Boy, I sure goofed! I just don't know what I was thinking about."

In-flight brakes for jets: This is General Electric's latest contribution to the J-47. It's accomplished by a thrust spoiler mounted in the tailpipe of the engine. Gas is deflected before it gets through the nozzle. Forward thrust is cut materially. What next? A thrust reverser to counter forward motion, to do for the jet what reversible pitch does for the piston engine—shorten landing roll, etc.

Is the turboprop transport being abandoned? United Air Lines thinks no suitable engine is available, that by the time air lines would buy planes so equipped, competitors will be using jets enabling speeds 200 mph faster. So, Douglas will probably get a $50-million United order for a fleet of DC-8's with the J-57 engine. UAL would like to abandon its piston-engine airliners in five years, turn completely to jets. Convairs would be "worn out first" on short hauls.

High seas operations: That's what the Navy hopes for in its *Sea-Master,* four-jet seaplane in the 600 mph class, cruising at 40,000 ft. The fact that it will take 6 ft. waves easily means it can operate in the open ocean about 85 per cent of the time. One forecast is that the new plane is the forerunner of jet seaplanes with no limit to size and utility.

Aviation medicine a science all its own: Dramatic evidence of this is scheduled in Washington, D.C. March 21 when Aero Medical Assn. hears the world's experts in the field. Cosmic ray effect on human tissues, boiling of blood at extreme altitudes, human tolerance of multi-stage rocket accelerating curves are but a few of the fascinating discussions. But a panel, "The Sky Unlimited," will be the real headliner. The world's fastest civilian and military pilots from England, Canada and U. S. will tell the aeromedical aspects of their experiences.

Masters of the Air is the title of the newest educational booklet on aviation from Smithsonian Institution, Publications Division, Washington 25, D. C. It's a 32-page, handsomely illustrated job telling the progress of aviation from the Lilienthal Bros.' first glider flight in Germany to the superjets of today. Priced at 50¢.

Restricted flying into or through security areas: New rules coming in the next five or six months. "Too many needless scrambles," say military controllers. These become necessary when civilian or military planes fly into or through Air Defense Identification Zones.

Fires from crash impacts may be a thing of the past. A new-type nylon (impregnated with rubber) fuel tank shows great success in tests. Cessna may use it on its business-executive plane. But it adds a lot of weight over ordinary tanks, 200 to 600 lb., depending on type of plane. Testing is done by crashing a one-ton wing section with the water-filled tank inside against a steel-backed sandbag barrier. CAA, Goodyear and U. S. Rubber have experimented for five years in the program.

Of Things to Come: Fifty million passengers a year carried by commercial planes in five years compared with today's 32-million . . . More output of the *Corporal,* Army's surface-to-surface atomic missile, when Firestone completes a new $2-million plant at Los Angeles . . . Canada converting 50 Avro CF-100 fighters into dual control trainers . . . A completely automatic aerial refueling system that will operate in any kind of weather . . . Results from "Project Jet Stream" in Florida, to be known rather fully by the end of this March . . . Air Force to enable its ROTC college students to take flying lessons, maybe. Jet airliners taking off and landing vertically when built like rockets and using clusters of jets and finlike vanes to divert backward thrust to the vertical. END

Shoreboat

(*Continued from page 22*)

However, do not put hole through bottom of box as yet. If a stuffing box other than the Cameron is to be used, the passage through the keel should be altered accordingly at this point.

Motor mount supports are now cut from 1/4 sheet and forward mount cemented into place, using fuelproof cement. Cut motor mounts from 1/2 x 3/8 hardwood and set aside with the rear support. With a small file, make several notches in the end of the stuffing box tube similar to a hole saw. Slide tube through passage in keel until it strikes the bottom of the radio compartment floor. Rotate tube back and forth, applying gentle pressure until it makes its way through. Slide tube to bulkhead A2 and repeat above procedure. This will result in a snug fit between tube and structure. Pin rear mount support and mounts in position, but do not cement. Slide prop shaft through tube and screw on universal. Remove plug from engine and place engine between mounts. Holding engine with one hand, slide universal into drive slots and rotate shaft with the other. If shaft does not rotate freely, it may be necessary to jockey engine or move rear mount support slightly until proper location is found. When engine position affords free rotation of the shaft, mark location of rear support and cement support and mounts in place, using plenty of fuelproof cement. When mounts have dried thoroughly, mark off mounting holes and drill and tap for 4-40 bolts, using a 5/64 drill. This method of mounting has proved to be very satisfactory and we have used it in our planes for a long time.

Remove universal and slide tube out of structure. Drill 1/4 in. holes through stuffing box tube supports made from 3/32 ply and cement into place, one on each side of bulkhead A2. Slide tube through to check alinement, but do not cement as yet. Cut out rudder post from 1/4 sheet and bind on shaft tube with thread, cementing heavily. Drill hole through bottom of box and keel and cement post into place.

Cut six pieces of 3/32 I.D. brass tube about 1/2 in. long and cement in place at bulkheads B7, B9 and B11, making sure to plug the lower end of each tube with scrap balsa or cement. This is important, for if it isn't done, water may get into hull. Top of tubes should come flush with the top of side decks. Holes through deck are made in same manner as stuffing box tube holes.

All areas to be covered by the skin should now be given two coats of dope. When dope dries, cut bottom skins from 3/32 sheet, allowing a little on each end for trimming. Save ends of sheet for cabin sides and top. Place strips of scotch or masking tape the full width of sheet at least 12 in. back. This prevents splitting of wood during bending and pinning and affords more uniform curves, should unequal grain be present in sheets. Apply cement, liberally, to bottom bulkheads and pin skins into place, starting at bulkhead C10 and working forward. Be sure to cut out skin for tube. When bottom has dried thoroughly, remove pins, trim and repeat above procedure on sides. When sides are dry, remove pins, trim and add 3/32 ply transom. When transom has dried, sand hull and transom to blend.

The cabin is "built in place" to assure alinement and a snug fit between cabin supports and motor compartment. Trace and cut out cabin sides and top from 3/32 sheet. Use the surplus stock from the sides and bottom. Place wax paper on all areas where cabin will make contact. Pin 1/8 sheet cabin supports in place and cement on cabin sides. Cement in rest of framework, pinning as you go, and add cabin tops. When cabin is dry, remove and sand all sharp edges to blend into a smooth contour. (*Continued on page 44*)

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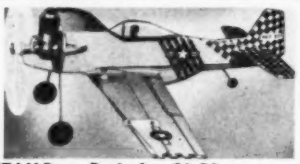

LITTLE DEVIL $1.50
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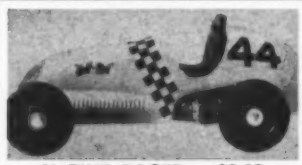
SPAN: 26" For .099 to .23 Eng. Authentic scale, for class A or B. Deluxe kit super-prefabbed, carved balsa fuselage, airfoiled wing, etc.



½-PINT RACER $2.95
LENGTH: 9" For "½A" Gas Eng. New, improved model. Speeds over 40 m.p.h. Direct wheel drive. Prefabbed formed body, rubber wheels.

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SPAN: 18" For .039 to .074 Eng. Carved fuselage model, an excellent U-Control flyer. It's completely prefabbed. A cinch to assemble.

WACO CABIN $1.50
For .020 to .049 Engines
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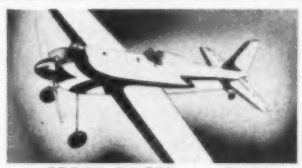
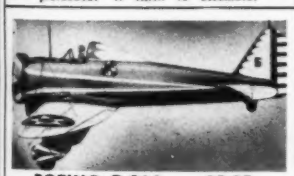
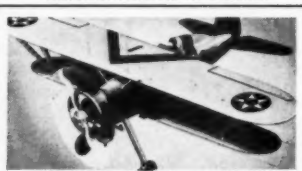
SPAN: 18" For .035 to .074 Eng. Scale model of America's favorite private plane. Prefabbed kit includes carved balsa fuselage, formed cowl.



SPORT RACER $1.50
SPAN: 18" For .020 to .074 Eng. A good U-Control performer at a remarkably low price. Completely prefabbed kit. Easy to assemble.



BOEING P-26A $2.95
SPAN: 18" For .020 to .074 Eng. An excellent control-line flyer. Prefabricated kit is complete in every detail . . . all parts finished.



BOEING F4B-4 $2.95
SPAN: 17½" For .020 to .074 Eng. Brand new deluxe U-Control model. 100% complete with carved balsa fuselage, wings, etc. A real 'honey'.

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SPAN: 18" For .049 to .099 Eng. For team racing or sport flying. Kit is 100% complete with formed fuselage & wing, metal cowl, etc.

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LENGTH: 14" For .020 to .074 Eng. A "beaut" of a speedboat. Prefabbed model is 100% complete—carved balsa hull, brass fittings.

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For "½A" Eng., Electric Motors Authentic Chris-Craft replica with a 12" carved balsa hull and brass metal fittings. All parts finished.

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For "½A" Eng., Electric Motors Here's our sleek cabin cruiser. Has a removable balsa cabin, 14" carved balsa hull - 100% complete.

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The lid for the radio compartment is made from 3/16 sq. strips and four pieces 1/8 x 3 sheet, 5 in. long. These four pieces will not quite cover the entire compartment, so a narrow strip of 1/8 scrap will be needed to complete the required coverage. Cut the required 3/16 sq. strips to proper length. Pin together, placing wax paper between the one that is to be cemented to the lid and the one that will remain in the box. Cement box strip into place with pins that hold two strips together pointed down, making sure that the top strip is bare and flush with top of compartment, while wax paper covers edge of compartment. Cement lid pieces of 3/16 sq. strips and allow to dry. When cement dries, remove pins and sand edges of lid to shape.

Cut three pieces of 1/16 wire, about 9 in. long, and tape together with scotch or masking tape. Bend all three wires at the same time to form canopy cross-pieces. Remove tape and insert wires into brass tubes along the side of radio compartment, making sure they are equal in height. Solder longitudinal wires in place, starting with the top center wire and working down on each side, until all but the bottom wires are on. Mark position of the bottom wires, remove frame from boat and solder on last two wires. This is done to prevent burning the wood. When soldering is complete, sew on covering of your choice and give entire canopy two coats of dope, inside and out. We used an old clothespin bag for the covering as it had a desirable striped pattern.

Fill passage for the stuffing box with a thick mixture of plastic balsa and cement and the hole through bulkhead with plain cement. Slide tube into position and make fillets of the plastic balsa and cement mixture where it passes through the structure. Make sure the brass is clean so the cement will stick.

Cut out the rudder from 1/32 brass and make four equally spaced cuts about 3/16 deep along the forward edge. Bend 1/16 wire to shape and slide on Sullivan wheel collar. This collar acts as a spacer and shaft bearing. Slide wire through the tube. Bend small tabs on rudder, formed by cutting, around shaft and solder.

In order to prevent splitting or cracking of the balsa skin, should rough handling be encountered, it is advisable to cover at least the hull with one or two layers of Silkspan. This will also help fill the grain and give a better finish. Sand entire boat and apply several coats of sealer, sanding lightly between each coat. Apply Silkspan, one coat of sealer and three coats of clear dope. Finish in desired colors and wax all exterior surfaces with Johnson or Aero-Gloss Wax. Be sure to fuelproof all areas where fuel or exhaust may come in contact with painted surfaces, especially inside the cabin and motor compartment. If plenty of fuelproofer is used inside the cabin on the exhaust side, there will be no need for an exhaust stack; however, cabin and motor compartment should be wiped clean after each run.

We used a 1 oz., Acme Team Racer gas tank, which gave us about six minutes' running time, but almost any tank may be used. Know in advance just how long your tank will last, so you can head the boat into shore and not get stranded in the middle of the lake.

Install deck fittings to suit. There are some very fine fitting sets and individual pieces on the market, enough to have any type of "dress up" desired.

The water cooling system is best installed after the boat has been run at the highest speed desired. The planing characteristics of Shoreboat are dependent on the weight and distribution of batteries and radio used. We used many combination of batteries in testing and the layout shown on the plans worked out the best. This particular weight distribution caused the boat to plane with the section

forward of bulkhead C6 out of the water on high speed; therefore, the water pick-up was installed midway between C6 and C7. Run boat at the highest speed desired and note plane line. Install water pick-up tube just aft of this line. Complete instructions are packed with the engine, so you will have no trouble at all.

Now a word about the radio and steering gear. For single speed and all around simple operation, the ED Clockwork Escapement is very good. We have used advance test models of the Cameron Multiple Contact Compound Escapement and Marine steering unit with great success. Also, to operate a semi-proportional steering, we altered a Bonner Compound Escapement to provide three electrical contacts. In this system, one pulse starts a miniature electric motor turning in one direction through a gear box and linkage, causing the rudder to turn the boat to the right. When the signal stops, the rudder remains in whatever position it happens to be until another signal is sent.

If left turn is desired, two pulses are given, which closes the second set of contact points, reversing polarity on the motor and turning it in the opposite direction. Three pulses, of course, give engine control.

To alter a Bonner to provide three contacts, proceed as follows: make wire loop to fit around escapement arm in the conventional manner but, instead of running wire back, as in the case of an airplane, solder a cross-piece, or rocker arm, at base of loop. Make two sets of points from brass shim stock. Separate points by cementing one strip of brass on either side of a short piece of 1/8 sq. balsa. Place one set of points under each side of rocker arm, so that when one pulse is given, escapement throw will move arm down and close points. Two pulses will cause second set of points to close.

Although sequential in operation, the ED Marine escapement has provisions for half position rudder control and engine control.

You will note, from the plans, that a large space lies just forward of bulkhead A1, between top and bottom decks. This was designed as an alternate position for the receiver, should more room in the rear compartment be desired, or for the two-speed unit. Naturally, if this space is put to use, an additional hatch must be built. If the two-speed unit is to be located in the motor compartment, it should be boxed in to protect from moisture. In either case, the rubber for the two-speed unit is connected to bulkhead A2.

Good luck and lots of fun. END

Engine Review

(*Continued from page* 24)

types of internal combustion engine. Consequently, the crankshaft does not have to be so rugged in bend and shear strength, which, of course, largely governs the shaft dimensions.

It is good engineering to build the same safety factor into all the parts as you establish over-all stability by your weakest part. The .99 is designed for a certain type of performance and it is proportioned throughout in a manner adequate for this performance. As a result it is extremely light in weight for the payload it will move. But here we have another anomaly. Its power/weight ratio in bhp/lb. is strictly old fashioned at about .7 as compared with a racing .60 at 1.5 or more, so why use it when the figures belie everything we have said? The answer lies in the fact that an aero engine is only as good as the prop it drives, and to develop appreciable bhp, an engine has to turn out five figure revs, which usually means light loads at high airspeeds and small props. Eight, nine, and ten foot models weighing as many pounds just don't fit, especially as they are so large that the small prop does little more than blow oil on the windshield. A big model with a fat fuselage has to have a prop large enough to embrace a clear airstream, and such a prop has to have an engine that is efficient at the resulting low speeds to drive it. A hot .60 turns out a fussy, erratic .5 bhp at 7,000 rpm. The Forster .99 turns out a smooth, dead reliable .6 bhp at the same speed, and for the same engine weight. In addition it is capable of idling reliably at under 2,000 rpm by means of its two-speed timer and alternating between the two figures with complete reliability. If your radio control ambitions extend to a big, beautiful, realistic nerve soother, then the Forster is your engine.

This engine is what we have come to regard as an old fashioned and outmoded design, as regards construction. However, it would be more true to say that it is a fairly efficient design for an old fashioned and outmoded type of model aircraft. In recent years we have been swept away by the novelty of small power models and the thrills of U-control, and now that these have found their own level, it seems that there is a revival of interest in big stuff because it can now be reliably controlled by radio. So the old fashioned design becomes a modern need.

Basically, the engine consists of a two-piece pressure die cast crankcase with a one-piece die cast aluminum cylinder with steel liner, the head bolted on the upper face of the crankcase. The now rarely-seen three-port induction system is used with the carburetor air intake attached to the cylinder. The bypass is effected by passing the charge through a port in the piston and a coinciding port in the cylinder into an external passage covered by a bolted-on plate, and thence through the normal bypass ports into the cylinder.

The crankcase has a front and back casting with the paper gasketed joint on the cylinder bore center line. Four bolts with lock washers hold the castings together. The two halves spread out at the top to form a wide platform which provides mounting lugs and a machined surface, to which the flanged cylinder casting is bolted with four screws and lock washers. This results in beam mounting lugs which are well above the usual crank center-line position, and since only the upper surface is machined flat, with a casting draft angle on the under surfaces, it is advisable to use the upper surface as the mounting face. This is a strong case for mounting the engine in the inverted position. Mounting on the under face of the lugs is likely, by virtue of the draft angle, to distort the crankcase and cause leakage of the center joint.

The front casting incorporates the main bearing housing and is bushed with sintered bronze. A 3/8 ID x 7/8 OD ball bearing is provided at the inside end, and stepped machined edges for point housing mounting at the outer end.

A built-up crankshaft is used, consisting of main shaft, crank web and crank pin pressed together and finish machined, heat treated and ground as a unit. The crank pin is 5/16 in. dia. and hollow, and counter-balanced by a cutaway web which accounts for a proportion of the reciprocating weight as well as all the rotating weight. The web is nearly 1/4 in. thick. The outer end of the shaft has a 5/16 thread and is provided with a flat for keying both prop drive washers, and has sufficient length to accommodate props of 3/4 in. hub thickness.

The conrod is a sturdy aluminum die-casting of T-section having sintered bronze bushings of identical dimensions at both ends, thus making the rod reversible. This contributes to long life since the lower bearing will wear first, and reversing will extend the period before wear becomes serious.

A gravity cast aluminum piston with stroke length skirt and two cast iron compression rings is used. The wrist pin bearings are honed to the tubular hardened and ground

pin, which is retained by a miniature snap ring at each end. A nicely contoured low compression baffle giving high turbulence completes a beautifully workmanlike job. An indication of the accuracy of fitting and wearing characteristics of rings and bore is the fact that at the conclusion of the tests, some four hours' total running, the rings were worn very evenly and the break-in grooves were still visible, as were the honing marks in the cylinder bore.

The port in the piston skirt which forms part of the bypass system is cored out during casting, and is arranged to open fully at bdc, and to commence opening before the conventional bypass ports.

This arrangement gets the charge moving preparatory to delivery to the cylinder, since there is a slight vacuum in the passage trapped from the upward stroke of the piston.

Twelve very deep tapered fins provide efficient cylinder cooling and the engine appears capable of sustained idling with very little air movement without overheating.

A die-cast exhaust stack mounts to a suitable face on the cylinder and is retained by two screws inside the stack. For scale applications a realistic plumbing system can easily be fitted by constructing it so that the screws come on the outside.

Square multiple cylinder ports are used throughout, and a great deal of the volumetric handicap of three port induction is overcome by making the carburetor port narrow and fairly wide. The corresponding air intake is a bolted-on die casting with a trumpet mouth, a 1/4 in. bore and a narrow diverging passage to the inlet ports. The .29 intake bore is rendered more efficient at high speeds by having a spraybar offset to the very edge so that there is no obstruction to mixture flow. In practice this system works very well with smooth, progressive needle control and smooth instant pick-up from low to high speeds.

The spraybar itself features a very fine thread and locknuts at both ends to permit correct positioning of the jet hole in relation to the intake passage. The needle is ground to a fine point and is soldered into the standard Forster split sleeve nut type of control knob.

The very successful Forster patented point breaker housing is used with twin point sets, providing simple and precise adjustment for gap by means of thumb nuts. The moving point rockers are hardened and tungsten points are used, as a result of which no point adjustment was necessary throughout the tests.

The .99 handles delightfully, as we have said, and we can say without reservation that the most discriminating users will be well satisfied. This is to be expected from a big engine, but is not always found to the same degree. For those who have never before handled an ignition engine, the way in which speed can be controlled by simply moving the advance lever will come as a pleasant surprise.

The system for setting the mixture and spark controls for efficient two-speed operation is simple and straightforward, and if good batteries and clean fuel are used, the settings stay put. The clean take-over from one speed to the other enables the "throttle" to be blipped with the assurance that a known amount of power will be there immediately, and that the engine is not going to splutter and stall. It should be borne in mind, however, that gasoline fuels do not tolerate such a variation in mixture strength as alcohol fuels, and special attention should therefore be paid to tank position if violent maneuvers are anticipated.

When setting the controls, the most simple procedure seems to be to get the engine running at maximum power on the *high* points, then enrich the mixture by half a turn. Switch to the *low* points, and adjust the mix-

ture for maximum speed and retard the ignition control until the minimum speed is obtained at which the engine will two-stroke. Switching to *high* will then give immediate response and close to optimum power, depending on where you set the point assembly for idling. Those familiar with two-speed spark ignition will find that considerable trimming beyond the limits of point angularity can be executed by adjusting the point gaps, but for normal purposes, the speed change ordinarily available is perfectly adequate for a large model.

A locking screw and spring will be found inside the housing, which, in the event of housing creep, can be tightened permanently if desired. Starting can then be effected on the *low* speed points.

TEST: Forster Two-Speed .99

Fuel: Eight parts unleaded gasoline; one part Havoline SAE 70 motor oil; Running Time Prior to Test: Three hours; Bore: 1.0625; Stroke: 1.125; Weight: 13-1/4 oz.; Ignition Equipment: Smith Competitor Coil and Condenser; Champion V 3/8-24 plug; 4-1/2 volt battery.

Props

Although Top Flite and Power Props are normally used for these tests, suitable sizes are not available for an engine so large. Props of various makes, both domestic and foreign, have therefore been used and we cannot vouch for their dimensional accuracy in relation to one another.

SIZE	*RPM*
16 x 4 (wide blades)	6,500
15 x 6	7,100
14 x 8	7,600
14 x 6	8,050
12 x 8	8,200
12 x 6	8,400

NOTE: *It is necessary to add ether to alcohol base fuels in order to get easy starting. Although slightly more power is available, the engine handles better with the cheaper gasoline fuel, and we feel that results with it are most interesting to the most people. Low compression ratio is the reason.* END

MAN at Work

(*Continued from page* 6)

place. Since his modeling days, Dallas piled up 4,000 flying hours in Army observation, low altitude attack, cotton dusting, and as a Clipper captain. On his last vacation, he piloted uranium prospectors in New Mexico. PAA and AMA are cooperating to make the service available at major selected contests where facilities are suitable for Mooney operation. Between search flights, the Mooney will be on display.

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▸ A glimpse of the inner workings of one of the big annual contests should be prescribed for any complaining contestant. Ted Clodius is the man at the New York Daily Mirror who annually handles about a dozen big promotions, the Mirror Flying Fair being the biggest one-day model tournament in the world, exceeding in some years the size of the week-long Nationals. A select group of RC entrants and judges spent an evening with Ted to help devise a plan for the monstrous radio event. Sample: within 10 days of sending out registration blanks, 200 people entered radio, 180 of them other events also. It's that way every year—the miracle is that people have been known to get in three flights. (One year, McElwee had the thing won at 6:30 in the morn!) If all entrants made one flight, without a lost second, you'd have almost a 24-hour day. So far, no one has put lights on these things! Some of the rules—and, incidentally, AMA rules apply in the main—are: must check in by 9 a.m.; called in order of checking in; if no fly, you get hit with an attempt. No delays; two attempts. Seven minutes, two of them for getting airborne. Unique feature is that contestant may have himself listed at any time after that for his second flight, then has to fly when called. He's responsible, therefore, for getting in his own second flight; must allow for the line and for watching closing time. Yours truly will be hiding behind the dark glasses this year, but if the event comes off the way it was planned, thank Frank Yuhasz, Carl Schmaedig, Howard McEntee, Al Lewis, Ed Yulke, Bill Johnke, Art Hasselbach, Jerry Stoloff for a big assist.

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▸ Among the dozens of planes hanging up in deBolt's workshop on a visit two years ago was a natty looking craft, a cross between a team racer and stunt model. A full pattern, high performance stunter, in other words, but with the speedy lines of the racer. We have a very special reason now to recall that airplane, for it was the Continental, which DMECO now has released to celebrate their tenth anniversary. It seems like only yesterday that Harold was coming out of the Navy, fired up with postwar dreams of putting out performance airplanes in quality kits. The Continental represents 10 years' progress in kit making; is a new high for DMECO in die cutting, machining and shaping. Many is the time we've flown with Harold, always careful to stay upwind of his corncob.

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▸ Lunch with Tom Sutor, Coral Gables, Fla. Tom pushes a DC-6 for National Air Lines, directs the King Orange Internationals and is president of Exchange Club's Model Aviation Corp. King Orange replaces the Tangerine Internationals. Orlando sponsored that one but, when over 700 entrants checked in, Orlando found the job too big. Tom is already at work on next year's King Orange—they can handle any crowd. James Monroe, Miami, was grand champ this year; Bruno Markiewecz, Detroit, tops in Open Senior, Roger Barron, Springfield, Va.; Junior, Buddy Medlock, Atlanta. Dale Kirn pushed jet, on Mono-Line, up to 159.51. Jim Walker, all the way from Portland, Ore., to put on his famous exhibition flying. The Marines went all out to put over the meet . . . Quiet session at Jasco's with Victor Moore, heading up the Eastern District promotion for Civil Air Patrol. CAP had officially turned down modeling for "lack of time in their program," but Moore hasn't given up. Seems to us that, if 90 per cent of the Navy aviators once built models and that modeling experience was recognizable factor in Air Force training program (these things are on record), all the Air Force needs to do is ask recruits if they ever built models. CAP had better release the gust lock before they try to take off . . . Ed Schlosser, Best by Test, on a whirlwind visit. He's the guy behind Ten Minute Glue. Spread it on two surfaces, allow to dry, then press parts together. Ed did this with strips of metal, wood and even cloth, gave us one end to hold, then yanked us out of the chair. Convincing, but undignified. Art Hasselbach, Consolidated, interested in the trade end of it, goes around building Jumping Jack stunt models in thin air, before your eyes . . . Pete Bowers, old time modeler, collector of plane pix, glider and power plane test pilot, with stories about flying on standing waves. If you play the rising wind over a ridge, you can travel like sixty, or climb to dizzy heights. Pete, who owns a Wolf sailplane and an Aeronca C-3, says we should publish authentic data on WW 1 markings. Will do.

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▸ Lunch with Carl Tobin, who flies RC with Schmaedig, McElwee, Yuhasz, who take turns winning the Mirror Meet. Carl had a beaut of a canned receiver with an RK-61 and a transistor. Current rise to 4.5 mils, combined idle a shade over .3. Talk of local flying and boats, no less. If this boat stuff keeps up, we'll have to forget air youth in favor of boat youth. If modeling means so much to the services, they'd better figure on repelling the Ruskies with a fleet of motor boats. What did the Wrights and Lindy ever see in planes? . . . A

morning with Romano Garabello, whom we met at last year's Mirror affair. You have to watch this boy; he's a smart apple with modeling items and just maybe his boss, who owns a factory, will put them on the market. Very nice four-control servo, an unusually efficient escapement, a simple, bust-up proof deal for nose wheels, and a universal engine mount. More, but that gives the idea. The engine mount is a world beater—takes every engine, adjustable, and sturdy.

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Missed (drat it) the Bucks County Federation victory banquet. Al Abrams, member club, Bristol Aeromodeleers, did tell us that their Low Ceiling Indoor Contest was so popular last year that the lights had to be turned off to get the boys to go home . . . Bob Linn, Los Angeles, who is a member of the historical branch of the Institute of Aeronautical Sciences, and a judge of Coast scale contests, thinks scale ought to be an International Event, open to all sizes and types of powerplants; he criticizes our rules system because judging cannot be fair. Point system not flexible enough for close judging . . . Dave Domizi wowed by Dean's plans for his carrier winner but says it should have 1-3/8 dihedral, not 3/8. Says more dihedral gives stability in wind . . . Pop Robbers reports WAM had 188 modelers at the Sixth Annual Dinner, 24 clubs, marvelous dinner, wonderful time . . . Bob Tennenbaum wants us to say: "Yep, there will be a helicopter event at the 1955 Mirror Meet." . . . Tony Alvarado, Havana, says Cuban team competed at King Orange Internats, ferried over by AF, and says Greetings for putting out the best model magazine in the U.S.A. Greetings to you, Tony, for writing the nicest letters in Cuba, though it's a close decision! . . . Canadians, attention: Series of major contests at Calgary beginning with indoor record trials on April 19. Write Tom Oakenfold, 331 Seventh Ave., W., Calgary, Alberta, Can. . . . Aerocraftsmen Club, Baltimore, decided to eliminate radio from club activity, except for annual club contest. Aerocraftsmen is a free flight club. Good to see somebody stand up on his hind legs. RC can bust up a club—should be on its own . . . Bob DeVault, author of the reaction propulsion series, is an engineer with Marquardt, leading ramjet manufacturer. Ray Marquardt, an old modeler, remembered from free flight at Detroit Nats. Now keenly interested in our ducted fans. Bob says he is getting 6-1/4 oz. thrust from fan on a Space Bug .049. Ken Willard, formerly a sales engineer with Marquardt, now sales coordinator of missiles system division at Lockheed...Ted Martin —and this makes us proud—is in charge of General Motors' engine development laboratory in Canada . . . New book, Radio Control, Howard McEntee, $2.25, the Gernsback Library (Gernsback Publications, 25 W. Broadway, New York 7, N. Y.) is a must item for RC fans . . . Why do we publish rubber-powered models for beginners? Says Frank Morra, Jr., Pittsburgh, Pa., "I liked your model Tufnut: it got me started in the right direction in modeling." . . . New Yorkers, hear this: Van Cortlandt Park flying area now called Wiley Post Model Airplane Field, with fences, tables, benches. You U-controllers still needed for a showing. END

All About Jets

(*Continued from page* 14)

(pounds per square inch). In the solid rocket the fuel is already in the combustion chamber, mixed with the oxidizer. This is exactly the same sort of thing as a rifle cartridge or a shotgun shell. The pressure in the solid rocket is usually around 1,500 psi during burning. The solid rocket makes a convenient package for boosting take-offs of airplanes or missiles, while the liquid rocket is controllable and more efficient and so lends itself to sustained flight applications.

Fig. 2 shows the familiar propeller engine. The characteristics of this type of engine are much the same whether you use a piston engine, a turbine engine, or rubber bands to drive the prop. The propeller blades are rotating wings that pull the airplane forward by pushing the air back. The propeller actually creates a jet in the air in the same sense that a jet engine does, but the jet is usually invisible and is neither hot nor smoky. The propeller system is very efficient at subsonic speeds because it handles a lot of air very gently. The other engines use much less air to get the same thrust and consequently they have to push it harder; this wastes power and leads to high fuel consumption. Fuel consumption for the various engines is listed in the table following.

Fig. 3 shows a ducted fan engine. This type is rather rare, but it is descended directly from the propeller engine. All it is functionally is an enclosed propeller. The present full-scale types (Rolls-Royce Conway, Turbomeca Aspin) use turbine engines to drive the fan and obtain part of their thrust from the turbine exhaust. One of the first jet airplanes flown (Campini's) used a piston engine to drive the compressor, or fan. The fan is actually designed quite differently from a propeller, of course, but it does the same thing. We will show how to design good fans for model jet engines in a future article. The principal advantage of full-scale ducted fan (or bypass, it's the same) engines is that their efficiency is better than that of the other types, except for the propeller, and they do not suffer from the bad "compressibility" effects that limit propellers to speeds below 600 mph. A propeller blade rotates at high speed at the same time it is moving forward so that the tips may be traveling at Mach 1 while the airplane is doing only 500 mph. Put the propeller in a duct and you can control the speed of the air going past it and eliminate the compressibility power losses.

Fig. 4 shows a typical turbojet, the engine which has just about taken over the high speed field in the past ten years. This engine not only pushes air back at a high rate (its exhaust jet travels at Mach 1 and higher), but it heats the air also, obtaining still more thrust. Actually, the hot air is a sort of a by-product. Combustion is necessary to put enough power into the airstream ahead of the turbine, so that the turbine can get the power to drive the compressor. The remaining power goes out the tailpipe in the form of a jet. In turbine engines that produce shaft power (like our ducted fan example), more power is taken out of the jet to supply to the shaft; the jet then produces less thrust.

The turbine engine has become popular mainly because of one thing: its large power output for its weight. Present turbojets produce as much as 20,000 hp at high speed while weighing only a third or a fourth as much as would a piston engine of that size.

For those of you that are strangers to turbomachinery, we should define a couple of terms that we've been using. A turbine is a device for taking power out of a moving air or fluid stream. A windmill is a turbine. A compressor or fan puts power into the air. A propeller is a form of fan. A piston acts like a compressor on the compression stroke of a piston engine, and like a turbine on the power stroke.

There is more than one way to add power to an airstream and another way is shown in Fig. 5. This is an afterburner, a thrust boosting unit that can be added to a turbojet or ducted fan. The gas in a turbojet exhaust is still mainly hot air and contains a lot of oxygen. This makes it possible to spray in more fuel and get more thrust. About twice as much fuel can be burned in the afterburner as in the turbojet burner, since there is no turbine downstream to worry about burning out. This much more fuel provides only about half again as much thrust, so that it is uneconomical to operate afterburners except for short periods.

A variable size exit nozzle has to be used, also, so that the turbine engine will operate well with the afterburner off or on.

Fig. 6 shows both sub- and supersonic ramjets. In its simplest form, the ramjet has no moving parts. The air enters the engine and is compressed by the "ram" effect, the same force that blows signboards down. At sea level the pressure rise created by ram is about 26 x (airspeed in mph/100)^2, in pounds per square foot. Fuel is sprayed into the airstream and burned; the hot gases flow out the exit nozzle and produce the thrust. Since the ram pressure is rather small at subsonic speeds, subsonic ramjets are inefficient and quite large for a given thrust. At Mach 2, however, there is a compression ratio of nearly 8:1 available and a 2 ft. diameter ramjet can produce 50,000 hp (sea level conditions)!

The pulsejet is shown in Fig. 7. This engine became famous as the powerplant of the German V-1 Buzzbomb. Unlike the other engines, it operates in bursts, like a 1-cyl. piston engine. Big pulsejets run at about 50 cycles per second, while little engines (like the model pulsejets) run up to 300 cycles per second.

The pulsejet creates an awful noise, but its efficiency at low speeds is much better than that of a ramjet, so it is useful where light weight and low cost are necessary. Fig. 7 has been divided into upper and lower halves to show the two important parts of the engine operating cycle. Note the air flowing into the exit during the intake cycle. This is one reason why the pulsejet loses thrust at high speeds. We'll discuss this more next time.

The approximate sizes, weights and fuel rates are listed below for the different engines, based on a design thrust of 1,000 lb. at 375 mph at sea level.

Engine	*Diameter (ft.)*	*Weight (lb.)*	*Fuel rate Gal./min.)*
Rocket	1.0	50-100	50 (includes oxidizer)
Prop plus piston eng.	10 (prop) 4 (eng.)	1,500	1.6
Ducted fan	4	500	2
Turbojet	2	500	3
TJ with Afterburner	2	470	8
Ramjet	2.7	300	28
Pulsejet	1.5	200	14

So much for a brief description of the engines; now let's look at their performance at various speeds and altitudes. The good old piston engine puts out about the same power at any airspeed at a given altitude, but the jet engines are very much affected by airspeed.

Figs. 8, 9 and 10 have been prepared to show these effects. Figs. 8 and 9 really show the same thing, but one is in terms of thrust and the other, of power. The dramatic effect of speed on the power output of the jet engines shows up well in Fig. 9, while the superiority of the propeller at low speeds is obvious in Fig. 8. As in the table above, the engine sizes have been chosen to produce the same power at 375 mph, and therefore the same thrust at this speed.

Ducted fan curves have not been included on these charts for two reasons: there are already too many curves, and the ducted fan performance can be gotten pretty closely by simply sketching in curves half-way between the propeller and turbojet curves. After all, a turbine-driven ducted fan is just a cross between these two engines.

Fig. 10 shows how the thrust, or power, of the various engines changes with altitude. All the air-breathing engines that are operated full-throttle at sea level have a power decrease with altitude that corresponds closely with the pressure drop-off with altitude. With supercharging, the piston engine power can be held constant up to the "critical" altitude of the engine. In the future we can expect turbine engines to exhibit this same feature—not through the addition of a supercharger but by limiting the engine rpm at low altitudes. This actually does the same thing and for the same reason: to keep the engine pressure low enough so that the engine doesn't come apart.

Notice that the thrust of the rocket increases with altitude. The thrust of a rocket is highest in a vacuum.

Although Fig. 10 was drawn for 375 mph, it can be used for any other speed; the percentage changes of thrust with altitude are the same at any speed.

Well, this is all the space we have this time. Much remains to be said, and we hope in future articles to compare propeller systems with jets more thoroughly, because this is an important problem for model builders. In the next article, we'll present data on model jet engines and show how to select the best engine for your plane. Design details of high performance ducted fan model engines will follow. END

Radio Control News

(*Continued from page 26*)

no cause to gripe at a contest or flying session if you don't do your part.

In order to get the ball rolling and put some RC records back in the U. S. A., the AMA rules and records came through just before this column went to press. They are correct as of January 10. There are four FAI record categories for radio controlled powered aircraft, these being Duration, Distance, Altitude and Speed. The official FAI records are as follows: Duration—1 hour, 40 minutes, 35 seconds, held by Great Britain; Distance—no record established; Altitude—845 meters or about 2,772 ft., held by Russia; and Speed—58 km/hr or 36.039 mph held by France. The model specifications for all events are as follows: the total supporting surface area (wing

and horizontal stab.) must be no more than 16.14 sq. ft. Maximum cylinder capacity of the engine must not exceed .61 cu. in. The loading on the supporting surfaces must be at least 3.93 oz. sq. ft., based on the total weight of the model without fuel. This includes the engine, airframe and needed radio gear. The maximum weight shall be no more than 16.38 oz. sq. ft. and is based on the total weight of the plane, plus the weight of fuel at the time of take-off. In no case is the model to weigh more than 11.123 lb. The model must have an enclosed fuselage, except for cockpit or cowling openings similar to those of full scale aircraft. Nothing may be dropped from the model during the take-off of flight and a completely unassisted take-off is imperative. Can you do a job of designing within these rules?

And now a short resume on the requirements for the various record events. Duration-Timing begins when the model is released for take-off and ends when the model touches the ground or is definitely stopped in its flight or disappears from the view of the timekeepers. Timekeepers may follow the model in flight by any means of locomotion or with the use of any optical instrument. The one and only transmitter used must be at a fixed spot during the record attempt. As with the altitude and speed events, the landing must be made within 1,640 ft. of take-off. New records must exceed the old ones by at least two per cent increase in time.

Distance—The flier must submit in writing the point of landing and the model must land within 1 km. of this point. Loss of altitude between point of take-off and landing must not exceed two per cent of the total distance flown in a straight line. Distance is measured on maps and Great Circle routes, depending on the distance involved. A new record must exceed the old one by at least 10 per cent increase in distance flown.

Altitude—A recording barograph shall be carried by the model or the height may be measured by a theodolite or telemeter. New records must exceed the preceding record by at least five per cent.

Speed—A course 100 meters in length must be flown in both directions, without landing and within 30 minutes of each other. Timing is made as the model enters and leaves the marked straight line course and the average of the two speeds constitutes the record. A new record must exceed the old one by at least 5 km/hr.

Timing shall be gauged on instruments approved by the AMA and NAA and consist, basically, of two cameras electrically connected to a printing cronograph.

Who'll be the first to establish a U. S. record? At present there are no barographs in this country small enough for the application and no theodolites or telemeters have been submitted to the NAA for approval. Duration timing involves stop watches and the NAA has the equipment for speed timing. For more detailed information, write to the AMA at 1025 Connecticut Ave., N. W., Washington 6, D. C. Let's go!

WATTAGE OUTPUT CHART

Bulb No. 40	*Bulb No. 42*	*Bulb No. 46*	*Bulb No. 48*	*Volts*
(Read wattage in vertical column)				
.055	.180	.100	.038	1.0
.112	.367	.198	.075	1.5
.176	.590	.306	.120	2.0
.261	.860	.432	.165	2.5
.345	1.146	.585	.219	3.0
.437	1.470	.763	.273	3.5
.540	1.768	.952	.340	4.0
.639	1.970	1.125	.396	4.5
.725	2.520	1.415		5.0
.752	3.020	1.650		5.5
.930	3.480	1.920		6.0

These figures were compiled in 1951 from an average of four bulbs of each type. For accuracy it is suggested that each bulb be calibrated as to voltage and current. AC or DC may be used as the source for calibrations.

NEW ITEMS

We hope this first item still finds some cold weather fliers. The idea was picked up from Frank Ritchie of the East Park Model Club of East Park, N. Y. It was omitted in the March issue and then it was mentioned by Frank Schmidt of Schmidt Radio Controls, Erie, Pa. Both parties actually have used it to improve cold weather flying. What is it? Perhaps you've seen the small pocket warmers sold in sporting goods stores, department stores, etc. They measure about 1/2 x 3 x 4 in. and weigh about 2-1/2 oz. These pocket stoves give off plenty of heat for 12 houfs on just one teaspoonful of lighter fluid or white gas. Absolutely safe in operation, these heaters will keep your batteries and radio gear warm and enable you to fly with workbench performance in near zero temperatures. Mount the pocket warmer in a clip in the fuselage and pipe the heat through Reynolds aluminum foil ducts. This is, if you'll pardon the pun, one of the hottest items to come in for quite a time. Cost is from $1.95 up.

New improved Schmidt servos feature nylon gears for smooth reliable operation, three selective positions and a push or pull in excess of 10 oz., and weigh less than 2 oz. These servos operate from 3 volts, and three models are available for practically any type of application. Incidentally, the one big feature we find with the Schmidt five-channel receiver is the low 120 ma filament drain on 1-1/2 volts.

Polk's Model Craft Hobbies, 314 Fifth Ave., New York City, has the new Webra .8 cc (.049) Picollo Diesel. A small edition of the popular Webra .09 and .15, it packs plenty of power for that new Half-A RC job. This smoothly running and easily starting German Diesel comes complete with a unique fuel tank of ample capacity for Half-A flying and a prop made by HANSA, a famous name in German aviation. If this Half-A engine won't take up your RC job, nothing will.

Polk's and Electronic Specialties, 58 Walker St., New York City, are now making delivery on the long awaited Sigma 26F relay. This 8,000 ohm relay sells for $8.50, is super sensitive and is pre-set at the factory for reliable operation.

Besides the fine scale RC jobs which have been presented in MAN, it's good to see the number hitting the market in kit form. In addition to the very well engineered 72 in. Cessna 170 by Berkeley Models, West Hempstead, N. Y., there is the Cessna 180, a 45 in. craft by Sterling Models, 1530 N. Hancock St., Philadelphia 22, Pa., manufacturer of the popular Tri-Pacer. The Model Tech Specialties, Box 485, Ridgefield, Conn. offer the "old time" fans a 40 in. Fokker D-8 RC job suitable for .09 to .15 engines. Before you know it, we'll be having RC scale events as a regular feature at most contests. In fact, the California boys are well up on this score right now.

Then there is the Mitron RS-1 receiver, built and marketed by the Mitron Radio Co., Circle, Mont. Measuring 1-1/16 x 1-3/4 x 2-1/2 in. and weighing about 2-1/4 oz., this receiver uses an RK-61 in the detector stage and a 1AG4 as the relay tube. A 1V5 tube may also be used as the relay tube and the relay resistance may be from 5,000 to 8,000 ohms. A ceramic variable is claimed to replace the conventional rheostat in the plate circuit of the detector. Adjustments for battery voltage changes, antenna length and aging of the RK-61 may be compensated for by this capacitor. Model MR-2S receiver has a completely enclosed chassis and sells for $17.95, less relay and the open chassis model; RS-1 sells for $16.95, less relay. The company has also announced a transmitter with provisions for proportional control to operate with their two-channel receiver. This equipment should reach the market about April or May.

When it comes to clear cut and precise kit drawings, we have to give the bouquet to Electronic Specialties. Super-large pictorial drawings, from various angles, make it virtually impossible to go wrong when constructing the two-tube receiver. They also have a circuit diagram for a multi-test switching arrangement for our two-tube transmitter. This set-up allows you to make *all* test readings on both the oscillator and amplifier when using an 0-5 ma DC meter.

CLUB NEWS

The Richmond Flying Club of Staten Island held a contest in the fall of '54 and Henry W. Weiler sent in the results and some excellent photos. One shows Joe Ferrara's Cub .14 powered Bootstraps which took first place. A Control Master receiver and transmitter were used for rudder-only control. Note the convenience of the Broadfield RC field box which was written up in previous columns.

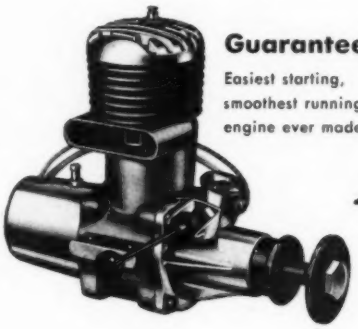
Other RC clubs and fans are requested to write to the Skyclippers' RC club in care of Richard Snyder, High Rock, Pa. An "all winter" flying club, this group has built a 7-1/2 ft. Buccaneer, powered by a two-speed Fox .59 and using deBolt servos on all controls.

We've heard rumors that our two-tube receiver works pretty well and is capable of taking a fair beating. However, the following two examples are a little more than we'd normally bet on. Back in June, 1954, Don Mason, Brighton, Mich., accidentally let his Live Wire Trainer, with a Lorenz receiver, get out of sight. About the middle of November, five months later, the plane was found, water logged, full of chipmunk deposited acorns and with completely deteriorated bat-

(*Continued on page* 54)

FREE!

ABSOLUTELY FREE! A WONDERFUL $4 KIT!



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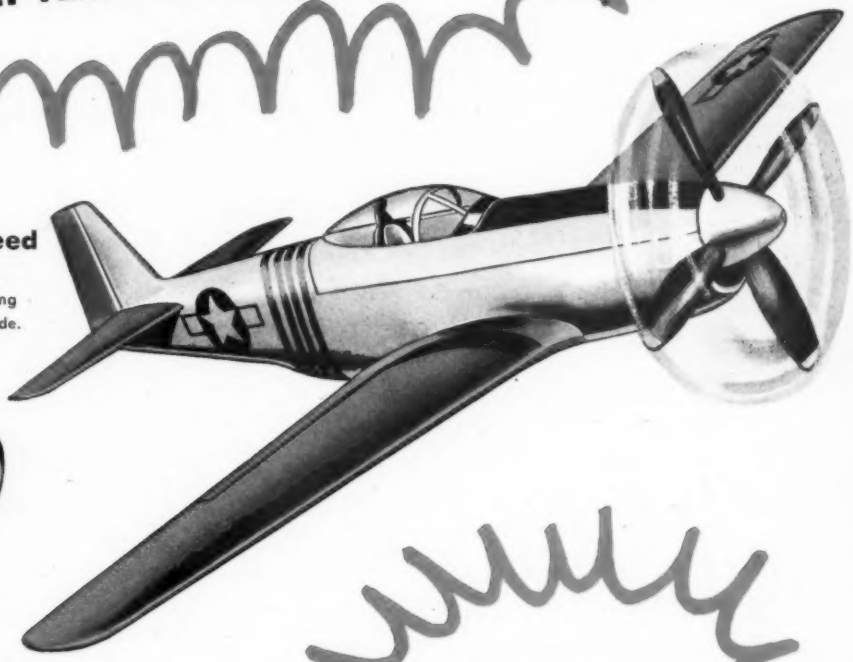
Easiest starting, smoothest running engine ever made.



McCoy's big 10th Anniversary Gift to you...

particularly the 1/2A modelers who want to try larger engines. Here's an opportunity to fly the new McCoy "29" Super Stunt... easiest starting, most powerful engine in its class with the longest fuel draw yet.

CLIP THIS COUPON

HERE'S ALL YOU DO:
First—Clip This Coupon Now!

Fly to your nearest hobby shop. Present this certificate. McCoy has arranged with your dealer to give you *free of cost*, any kit in the store up to $4.00 value with your purchase of the new McCoy "29." All you pay is the cost of the engine alone—just $11.95. Or, if you prefer, select the McCoy "36" at $12.95. The kit is yours for nothing. Then, enjoy flying at its best—free flight, stunt, combat, team racing. But hurry! This offer ends May 31, 1955.

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McCOY 10th BIRTHDAY CERTIFICATE

This certificate entitles bearer to any model airplane kit up to $4.00 retail value free of charge with purchase of a McCoy "29" Super Stunt Sportsman at regular price of $11.95 or "36" at $12.95.

Purchaser_____

Address_____

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(not good after May 31, 1955)

ADVT. INDEX, APRIL 1955

teries. The receiver was hooked up to a new set of batteries and it worked perfectly the first time, wih no adjustments needed. We believe this tops the experience of Sam Mintzer of Poughkeepsie, N. Y., who had his speed boat somersault on a sharp turn. After dredging the boat up several hours later, the receiver worked, better than ever, with the same batteries.

Ron Wilson, 21 Harding St., Flowery Field, Hyde Cheshire, Nr. Manchester, England, advises of his plans to fly across the Irish Sea, from Holyhead to Ireland, a distance of 52 miles, and then later to try for the duration record with a goal of six hours in the air. His equipment consists of a 3A5 push-pull transmitter, a la original Aerotrol, and 1S4 single hard-tube receiver. Mr. Wilson wishes to emphasize the need for simplicity. We've mentioned that before, too, and remember there is no difference between closing a relay by means of a single tube or three or four tubes, provided it can be done reliably.

Lt. j.g. Weldon Crawford, USS Valley Forge CVS45, c/o FPO, New York City, is one navy man who comes ashore to fly radio jobs and uses his wife's old nylon slips for covering them. The lieutenant is a staunch advocate of the use of nylon, double cementing of all joints and in the general beefing up of the model. His Live Wire Trainer blew a wing rubber on a dive at about 125 ft. and the fuselage continued straight down at full speed until it hit terra firma. Results? Why, only a broken prop, bent gear and a loose bulkhead in one spot. Twenty minutes later he was up trying the same maneuvers. Build 'em rugged and fly 'em longer.

The KC/RC Assn. is doing much to promote RC knowledge. At their monthly meetings, they have various speakers on technical subjects in addition to the latest movies of recent flying sessions. Joe Curtiss has given demonstrations and talks on the use of an oscilloscope and Paul Runge of Ace Radio Control, Box 301, Higginsville, Mo., has presented some interesting transistor circuits. Dan Walters reports that the meetings usually end up with coffee and doughnuts and a generally improved knowledge of radio theory and electronics. This is a group that goes in for "all winter" boat runs . . . brrrr!

From our ol' stompin' grounds in South Dakota, Carl Harris of Vermillion has scaled down the Live Wire Trainer by 15 per cent and gets excellent flights with a Cub .09. His Senior L. W. has proportional control and is reported to be a good flier. All flying out there in the wide open spaces is done with the two-tube receiver, which has been modified, construction-wise, by Jim Prusha of station KUSD. Modifications consist of mounting *all* components, coil form and tubes on one side of the receiver base. The receiver is then mounted solidly in the plane with the bare side of the chassis backed up with balsa, running in a plane parallel to the wing. Excellent shock absorbing qualities are reported with this type of mounting. END

1955 RC Rules

Here are the highlights of the New AMA rules for RC contest flying. Some controversy is expected over the event breakdown, which we shall discuss later. The general requirements are as follows:

Only one model may be entered, and in one class only, and may be of the powered ROG type or a towline glider, with no limit as to length of towline. No model may weigh more than 15 lb., ready for take-off.

The two classes of events are (a) Rudder-Only and (b) Multi-Control. The Rudder-Only event is for planes controlled only by the rudder, the only additional control being engine cut-off (not engine speed control). The Multi-Control event is for any plane using more than one control, such as rudder and elevator, rudder and engine speed, etc. There is no limit on the number of controls. The number of flights shall be established and announced by the Event Director and the allowance of an unlimited number of flights is encouraged. For local meets, the flight time is limited to five minutes from the time of release of the model and no points shall accrue after the time limit. At advanced meets, the ruling is the same, except that the time limit is 10 minutes. A flight will be considered official if two or more maneuvers (other than landing or take-offs) are judged, even though the attempted maneuver yields zero points by the judge. The point scoring system and types of maneuvers are too detailed to list here but should be available from the AMA by the time you read this.

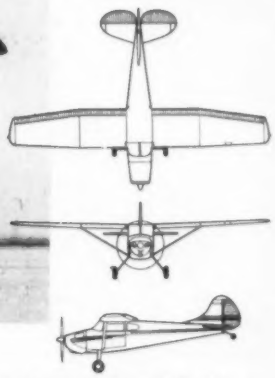
The controversial point, we believe, is the distinction between the Rudder-Only and Multi-Control events. The Rudder-Only class needs only a single-channel receiver which closes but one relay. What could be easier? However, this leaves nothing to the ingenuity of the modeler as far as "getting more for nothing" is concerned. If the flier wishes to use a Bonner compound, deBolt servo, or similar unit to operate rudder and elevator from a single-channel receiver, this puts him in the Multi-Control class. In this case, he must compete against Babcock, Schmidt and other multi-channel radio equipment. On the other hand, the Rudder-Only fliers will be on a very common standing with one another.

We'll sign off for now while we're still in a good mood with everyone. The main thing to be pointed out is the division into two classes of events and to let you know what should be considered before designing a new plane or fixing up the old crate for another season. END

R.C. FLYING SCALE

PRE-FABRICATED KIT INCLUDES:

- Full Size Plans with R.C. and PAA-Load Installation Details
- Sharply Die-Cut Balsa
- Formed Metal Landing Gear
- Hardware
- Covering Material
- Die-Cut Celluloid
- Mahogany Motor Mounts
- Authentic Full Color Decals
- Die-Cut Mahogany Plywood
- Pre-Fabricated Block Balsa
- Selected Strip Balsa
- Pre-Fabricated Wing Edges



Berkeley's

CESSNA "170"

For Radio Control — Free-Flight — PAA-Load

For .25 to .35 Engines — 72" Span — 2" Scale

Designed by: Henry Struck **$10.95**

Controlling your "170" by Radio is a thrill you will never forget! Perfect scale, rugged, stable in all attitudes, yet responsive in control with good wind penetration qualities. Gear location is ideal for extended take-off runs, while its larger size makes it less sensitive to turbulent air. A large cabin makes extra radio installations easy.

The plans include a wealth of scale details which will appeal to the master craftsman. Inexperienced builders will find construction simplified by the full size plans, sketches and assembly technique.

Inspect the "170" and its many features at your dealer. Study its design, examine the material, and visualize its performance on the contest field.

R.C. AMPHIBIAN...

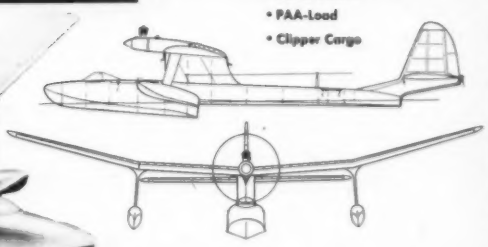
Fly it on Ponds — Rivers — Bays — Lakes or Flying Fields!

Fly it Five Ways:

- Seaplane (R.O.W.)
- Landplane (R.O.G.)
- Radio Control
- PAA-Load
- Clipper Cargo

- Detailed Full Size Plans
- Shaped Leading, Trailing Edges
- Die-Cut Balsa and Plywood
- Celluloid Bubble Canopy
- Metal Ring Cowl
- Hardware, Covering Materiel
- Selected Strip Balsa

$7.95



Henry Struck's **"SEA-CAT"**

N.A.C.A. Type Planing Hull Amphibian

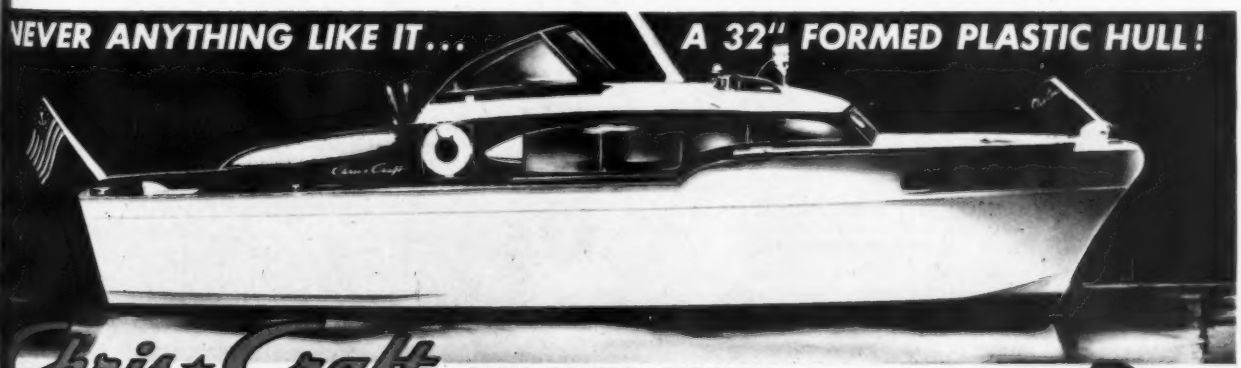
For .15 to .25 Engines — 68" Wingspan

First All-Purpose Gas Model

Here is a model design that has been a full thirteen years in development. It's N. A. C. A. Planing Hull design makes water take-offs easy. Its hull is easily accessible for radio control equipment, PAA Dummy Pilot or Clipper Cargo.

Proven performance on the original test models include: First International Radio Control Flight; Fourth place in a field of seventy in the Mirror Flying Fair (The first R.C. contest for both Struck and the "Sea-Cat"); First in Radio Control at Screamin' Demons Long Island Sound Hydro Championship; Second in PAA-Load at the same contest; and Precision flights carrying over a pint of fuel at the First "World Model Air Olympics."

NEVER ANYTHING LIKE IT... A 32" FORMED PLASTIC HULL!



Chris-Craft

RADIO CONTROL OPTIONAL! **1" = 1' Scale — 32" Overall**

"32' CRUISER"

For up to a .29 Gas Engine or two Miniature Electric Motors.

At your Dealers or via Railway Express Collect.

$14.95

- 32" High Impact Vacuum Formed Plastic Hull
- Formed Plastic Cabin with Mahogany Overlay
- Full Size Plans, R.C. Installation Details
- Cast Marine Deck Fittings, Authentic Decals
- Die-Cut Balsa and Mahogany, Celluloid, Etc.

Destined to change all concepts of model boat construction with its formed plastic hull and cabin, is this masterful reproduction of the ever-popular 32 foot Chris Craft Cruiser. Gone are planking and leakage worries, gone are long hours of hull construction and alignment, time which you can spend to better advantage installing radio control devices or in adding interior decorations. Gleaming white hull, trimmed in mahogany. See it at your dealer to appreciate the value.

Actual photo of Vacuum Formed Plastic Hull as Packaged in Kit.

Two New King Size "Championship Flying Scale" Designs

Berkeley's

Our Flying Scale Designs have won at every Nationals since 1938!

PIPER "TRI-PACER" PA-22 "150"

Replacing the Nationals Winning "Piper Super Cruiser".

$5.95

Structurally designed for the rigors of R.C. and Controline Flying its strength to weight ratio in free-flight permits active flying.

FREE-FLIGHT: Aileron, thrust, flap, elevator and rudder trim on field. Steady and consistent performance, easy to adjust and fly.

RADIO CONTROL: Designed for rudder control with optional R.C. wing flaps, motor control and automatic up elevator trim. Nose gear may be made to caster or operate by servo. Two cabin doors and hatch provide easy access to equipment. (126 cu. in. cabin.)

CONTROLINE: Details shown for installation of "U-Control" system. Ample strength for maneuvers, landings, rough handling. Ailerons handy for setting trim. Try two-speed engine, shoot landings, etc.

Designed by: Don McGovern

1½" = 1' Scale—44" Wingspan

Authentically designed from the factory plans! Structurally similar to full scale "Tri-Pacer."

For .065 to .099 Engines—Radio Control
.035 to .075 Engines—Free-Flight
.075 to .15 Engines—Controline

DESIGN FEATURES:

- Adjustable Thrust on Field
- Shock Mounted Nose Gear
- Shock Mounted Wing Panels
- Pop-off Wing Struts
- Fully Cowled Engine
- Sheet or Built-up Tail
- Self Aligning Fuselage
- Fully Detailed, Authentic

KIT FEATURES:

- Authentic Decals
- Three Rubber Wheels
- Formed Wire Landing Gear
- Full Size Plans with R.C. and Controline Details
- Sharply Die-Cut Balsa
- Die-Cut Mahogany Plywood
- Hardware, Silkspan Tissue
- Die-Cut Celluloid Windows
- Prefabricated Parts

"½A" Flying Scale DE HAVILLAND "BEAVER"

Authentically designed from the factory plans!

- Formed Metal Ring Cowl
- Sheet Metal Landing Gear
- Rubber Wheels
- Tapered Trailing Edges
- U. S. Air Force Decals
- Three Rubber Wheels
- Genuine Silkspan
- Full Size Plans with R.C. and Controline Details
- Sharply Die-Cut Balsa
- Die-Cut Mahogany Plywood
- Hardware,
- Die-Cut Celluloid

FOR FREE-FLIGHT— RADIO CONTROL— CONTROLINE

1" = 1' Scale
48" Wingspan

$4.95

For .049 to .075 Engines—Radio Control
.035 to .075 Engines—Free-Flight
.074 to .15 Engines—Controline

This high aspect-ratio Canadian Bush Flying type aircraft is now in use by the U. S. Air Force. Ideal as a free-flight, reinforced for R.C. and Controline contest or sport flying.

FREE-FLIGHT: Contest performance possible. Easy to adjust, and an excellent design for less experienced scale flyers.

RADIO CONTROL: Recommended for precision flying, as trainer, two-speed work, shooting landings, etc. Realistic performance.

CONTROLINE: Long moment arm provides full range of control on take-offs, landings, and throughout flight. Very easy to fly!

For Free Flight "½A" Flying Scale—Rubber—or Controline

$2.95

Cessna L-19 **BIRD DOG"**

$2.95

"SUPER CADET"

Current version of "Interstate Cadet," many time National's winner.

$2.50

FAIRCHILD 24 "RANCHER"

First at '53 and '54 Nationals!

$2.95

CESSNA "180"

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1955 CATALOG

At your Dealer, or by mail 10¢

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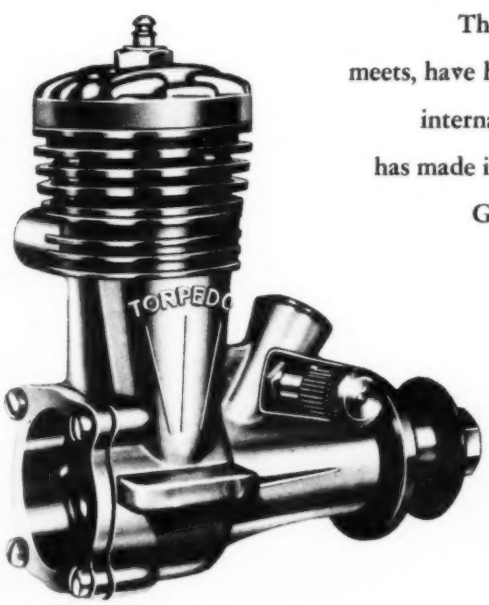
are preferred by champions and beginners alike!

From around the world come letters requesting the famous Torpedo engine. Those who haven't seen it in action with their own eyes, winning meets, have heard of its superb performance—it's long list of national and international records. This record of performance and dependability has made it the choice of champions and beginners everywhere. So be it in German, Icelandic, Italian, or even Bantu, when they want the best they ask for the K&B Torpedo.



If you have been unable to purchase the Torpedo engine of your choice, it is due to this *world wide demand* that far exceeded our capacity. We are doing everything in our power to meet this demand and are supplying your dealer as fast as we can . . . We thank you for your patience and just ask that you *please keep trying.*

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"FIRECAT" $4.95	OTHER MODELS $2.95 - $3.95
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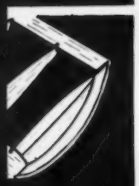
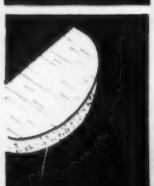
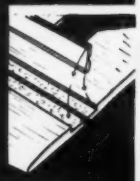
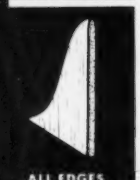
 WING TIPS ROUNDED	 SQUARE, UNFINISHED
 ELEVATOR HINGES PREFORMED	 LOOSE PARTS
 FUSELAGE AND WING INTERLOCK	 GLUED ONLY
 ALL EDGES SANDED SMOOTH	 SQUARE, UNFINISHED
 FORMED DURALUMINUM LANDING GEAR	 WIRE (or none)
PLUS: Wheels Canopy Push-Rod Bell Crank Hardware Flying Course Elevator Horn Lead-out Wires	NONE

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ENGINE: .29 to .35
SPAN: 43 inches

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Now at your nearest hobby counter

SO NEARLY FINISHED...

that without special tools or workshop you can have it flying in little more than an hour after you open the box! More value for your money than any kit on the market. Everything furnished except engine and tank. Look at the parts—they aren't just stamped out of wood but completely finished to exact shape. Slip together with cement, dope and start flying.

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"FIREBABY"
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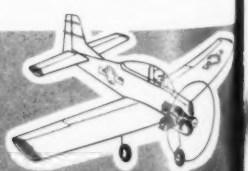

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New "Remote Throttle Control" [illegible] learning plane you can fly [illegible] quietly, or speed up and [illegible] mand. Complete with "Firecat" engine, all finished parts, [illegible]